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Options for Principal Forgiveness in Mortgages Involving Fannie Mae and Freddie Mac

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Abstract

The Congressional Budget Office (CBO) examined three options under which Fannie Mae and Freddie Mac would provide principal forgiveness to certain distressed borrowers—specifically, to borrowers who are eligible or could become eligible for the Home Affordable Modification Program (HAMP). Such borrowers represent about 4 percent of all those with mortgages involving Fannie Mae or Freddie Mac, CBO estimates. The options would reduce the amount owed by borrowers to as low as 115 percent (through the HAMP Principal Reduction Alternative), 100 percent, and 90 percent, respectively, of the value of their homes. Any gain or loss arising from the way the distressed mortgages are handled by Fannie Mae and Freddie Mac under the options would ultimately accrue to taxpayers because, in CBO's judgment, the federal government is now the effective owner of those enterprises. CBO finds that all three options would probably result in small savings to the government, slightly reduce mortgage foreclosure and delinquency rates, and slightly boost overall economic growth. Designing a program that affected a larger number of borrowers and had a greater impact on the housing market and the economy would require a significant departure from HAMP's current eligibility rules.

Summary

At the end of 2012, housing prices were 30 percent below their peak in 2006, and about one-fifth of borrowers with residential mortgages were “underwater,” owing more than the value of their homes. Default rates are particularly high among such borrowers. One of the primary ways that the federal government has assisted underwater borrowers is through the Home Affordable Modification Program (HAMP). That program, administered by the Department of the Treasury, has facilitated lower payments on some mortgages by providing incentives for mortgage holders and servicers to help borrowers avoid foreclosure.

In 2010, the Treasury Department expanded the program to include the possibility of principal forgiveness, a reduction in the amount the borrower owes. Before then, the program had been limited to other ways of reducing payments. (This report refers to HAMP without principal reduction as “standard HAMP.”) For the borrower, principal forgiveness provides not only a lower monthly payment, but also, unlike standard HAMP, an improved equity position as a result of the lower loan balance. Having equity (the difference between the value of the home and what the borrower owes) allows a borrower to more easily refinance or sell the home to avoid default and strengthens his or her incentive to continue to pay off the mortgage. Since the introduction of that alternative, one in four borrowers participating in HAMP has received a principal reduction, the Congressional Budget Office (CBO) estimates. However, that program is small—fewer than 120,000 borrowers had obtained a principal reduction through HAMP as of the end of 2012.

The approach of using principal forgiveness has not been adopted by Fannie Mae and Freddie Mac. Those two government-sponsored enterprises (GSEs) own or guarantee more than half of the outstanding residential mortgages in the United States. CBO estimates that nearly 13 percent of underwater borrowers with mortgages owned or guaranteed by the GSEs have missed three or more mortgage payments (in other words, are “seriously delinquent”), which is more than six times the rate for borrowers who owe less than the value of their homes. But Fannie Mae and Freddie Mac have not been allowed to implement principal forgiveness out of concerns about fairness, implementation costs, and the incentive that approach could provide for people to become delinquent in order to obtain principal forgiveness.

Fannie Mae and Freddie Mac incurred large losses from the surge in mortgage defaults that began in 2007, as did other investors in mortgages, which resulted in the GSEs’ being taken into conservatorship in September 2008 by their regulator, the Federal Housing Finance Agency (FHFA). Because the federal government is now the effective owner of the enterprises, any gain or loss arising from a change in the way the distressed mortgages are handled by the GSEs would ultimately accrue to taxpayers.

This report examines three options for the GSEs to use principal forgiveness for borrowers who are eligible or could become eligible for assistance through HAMP. CBO finds that implementing those options would probably do the following:

- Result in small savings to the government,
- Slightly reduce mortgage foreclosure and delinquency rates, and

- Slightly boost overall economic growth.

Designing a program that affected more borrowers and had a greater impact on the housing market and the economy would require a significant departure from HAMP's current eligibility rules.

What Options Did CBO Analyze?

CBO compared the GSEs' current approach (standard HAMP) with three options involving principal forgiveness for HAMP-eligible borrowers. (Such options could be adopted through legislation or by an administrative change.) Under each option, the GSEs would select for each eligible borrower a standard HAMP modification or a modification that includes principal forgiveness, depending on which one lowered the government's expected costs more. The options that CBO analyzed were the following:

- *Option 1.* GSEs choose between standard HAMP and the HAMP Principal Reduction Alternative; the latter reduces the monthly mortgage payment to 31 percent of the borrower's gross monthly income, primarily by decreasing the outstanding loan balance to as low as 115 percent of a home's current assessed value;¹
- *Option 2.* GSEs choose between standard HAMP and principal forgiveness that would reduce the outstanding loan balance to 100 percent of a home's current assessed value; and
- *Option 3.* GSEs choose between standard HAMP and principal forgiveness that would reduce the outstanding loan balance to 90 percent of a home's current assessed value.

How Many Borrowers Might Qualify for Assistance?

On the basis of detailed data about outstanding mortgages and FHFA's review of the potential effects of implementing principal forgiveness at the GSEs, CBO estimates that 610,000 borrowers with mortgages owned or guaranteed by the GSEs already are or, over the assumed two-year period of the program, would become delinquent and would meet all other eligibility criteria for HAMP under current policy.² CBO expects that another 550,000 borrowers will meet all HAMP eligibility criteria except for being in financial distress (defined as being delinquent or at reasonable risk of becoming delinquent); under a change in policy to introduce principal forgiveness, some of those borrowers might become delinquent. In total, those 1.2 million borrowers constitute the population that CBO considers to be eligible or potentially eligible for a principal forgiveness program. They represent approximately 40 percent of all underwater borrowers and 4 percent of all borrowers with mortgages backed by the GSEs as of December 31, 2012.

¹ The HAMP Principal Reduction Alternative incorporates principal forgiveness to a floor of 115 percent of a home's current value as the first step to achieve the target monthly mortgage payment of 31 percent of gross monthly income. If the target payment is not achieved once that amount of principal has been reduced, the mortgage servicer implements standard HAMP procedures, starting with an interest rate reduction, to complete the modification.

² Federal Housing Finance Agency, *Appendix to FHFA Review of Options* (July 2012), www.fhfa.gov/Default.aspx?Page=403.

How Would the Options Affect the Number of Defaults and the Federal Budget?

The key findings of CBO's analysis are the following:

- Under **current policy** (assuming extension of HAMP at least through December 2014), 227,000 borrowers with mortgages owned or guaranteed by the GSEs will receive a standard HAMP modification (37 percent of the eligible population of 610,000 borrowers and none of the 550,000 potentially eligible participants) over a two-year period. Approximately 600,000 of the 1.2 million borrowers, including some receiving a HAMP modification, are expected to default (see Table 1).
- Under **Option 1**, which includes the possibility of reducing the principal balance to as low as 115 percent of a home's assessed value, an additional 29,000 mortgages would be modified, leading to 18,000 fewer defaults and generating a savings to the government of \$0.2 billion. About 73 percent of the modifications under Option 1 would involve principal forgiveness.
- Under **Option 2**, which includes the possibility of principal forgiveness to 100 percent of a home's current value, the number of modifications would increase by 26,000, slightly fewer than under Option 1, but more defaults would be avoided (43,000). Savings to the government—at \$2.8 billion—would be the largest among the three options. About 85 percent of the modifications under Option 2 would involve principal forgiveness.
- Under **Option 3**, which includes the possibility of principal forgiveness to 90 percent of a home's current value, 57,000 more mortgages would be modified than under current policy, leading to 95,000 fewer defaults (the largest reduction under any of the three options) and savings to the government of \$2.2 billion. About 78 percent of the modifications under Option 3 would involve principal forgiveness.

CBO estimated the cost of the policy alternatives on a fair-value basis—that is, reflecting the estimated change in the market value of the portfolio of eligible mortgages.³ CBO's findings are based on the agency's best estimates of values for key parameters of relevant economic behavior, but there are many uncertainties. CBO analyzed the three options using higher and lower values for key parameters in the analysis. The agency found that combining standard HAMP with principal forgiveness under all three options would reduce defaults across the entire range of those alternative estimates. The budgetary savings are less certain, however. Nevertheless, Options 2 and 3 would reduce the federal budget deficit under nearly all alternative scenarios that CBO analyzed.

³ CBO has used a fair-value approach in its budget projections for the GSEs and in cost estimates for legislation affecting the GSEs. That approach produces estimates of the value of assets and liabilities that either correspond to or approximate market prices. See the testimony of Deborah Lucas, Assistant Director for Financial Analysis, Congressional Budget Office, before the House Committee on the Budget, *The Budgetary Cost of Fannie Mae and Freddie Mac and Options for the Future Federal Role in the Secondary Mortgage Market* (June 2, 2011), <http://www.cbo.gov/publication/41487>.

Introduction

The large number of people who now owe more on their mortgages than the current value of their homes and the deep recession of 2008 and 2009 have affected certain households, the federal budget, and the overall economy in various ways:

- Millions of people have been unable to make their mortgage payments, and as a result many have lost their homes to foreclosure.
- Consumer spending and economic growth have been constrained.
- The federal government assumed control of Fannie Mae and Freddie Mac, providing explicit government guarantees to investors against losses on more than half of the outstanding mortgages in the United States and adding substantially to the federal budget deficit.

Because of those and other impacts, policymakers have expressed interest in policies that would modify mortgages, potentially increasing consumers' disposable income, reducing the financial distress of households, and stemming the government's losses on mortgages. Current policies focus on lowering borrowers' monthly payments by reducing interest rates, extending loan repayment periods, and offering forbearance. This paper examines options for another type of loan modification known as principal forgiveness—that is, permanently reducing loan amounts. The analysis focuses on mortgages involving Fannie Mae and Freddie Mac because of the direct effects on the federal budget deficit of such options and the preexisting federal commitment to losses on those mortgages.

Why Are Underwater Borrowers More Likely to Default?

Of the more than 40 million borrowers with a mortgage in the United States, nearly 3.1 million borrowers were delinquent on their mortgage payments (more than 30 days late) and 1.6 million were in some stage of losing their homes to foreclosure at the end of the fourth quarter of 2012.⁴ Borrowers who are “underwater” on their mortgages—those whose loan balances are greater than the value of their homes or, equivalently, whose loan-to-value (LTV) ratios are greater than 100 percent—are more likely to be delinquent. For example, more than 20 percent of borrowers with LTV ratios greater than 125 percent have missed three or more mortgage payments (in other words, are “seriously delinquent”) compared with the national average of 7 percent.⁵ Delinquency rates are higher among underwater borrowers for three main reasons:

- Local economic weakness associated with lower housing values,
- Fewer options in the event of unexpected hardship, and
- Greater incentives to default.

⁴ Mortgage Bankers Association, *National Delinquency Survey* (Fourth quarter, 2012). Those figures represent 7.51 percent and 3.74 percent of the total population of loans serviced, respectively.

⁵ CoreLogic, *CoreLogic Reports Number of Residential Properties in Negative Equity Decreases Again in Second Quarter of 2012* (September 12, 2012), www.corelogic.com/about-us/news/asset_upload_file516_16435.pdf.

The number of underwater borrowers grew dramatically from 2007 to 2009 (and has remained fairly constant since then), translating those higher delinquency rates into much higher total numbers of distressed underwater borrowers.

Reasons for Delinquency. In the fourth quarter of 2012, about one-third of underwater borrowers were from five states: Arizona, Florida, Georgia, Michigan, and Nevada. Those states all had unemployment rates greater than or equal to the national average of 7.8 percent in that quarter. Nevada had both the highest fraction of borrowers underwater (52.4 percent) and the highest unemployment rate (10.2 percent).⁶ The weakness of those local labor markets illustrates that underwater borrowers tend to live in areas where they are more likely to experience reductions in income or job loss, which cause higher delinquency rates on mortgages.

In the event of unanticipated hardship, borrowers without sufficient income to make their mortgage payments or assets to pay off the mortgage have fewer options when they are underwater. Qualifying for refinancing of their mortgages, which would lower monthly payments and reduce hardship, is more difficult for underwater borrowers. Likewise, selling their homes and paying off their mortgages is more difficult because additional funds are needed beyond those available from the sale of the home.

In addition, some underwater borrowers decide that being relieved of the financial loss from the decline in their home's value is worth more to them than the costs of default, even though they have sufficient income to make their mortgage payments or assets to pay off the mortgage. Such decisions are sometimes called "strategic defaults." For example, consider a borrower with a \$200,000 mortgage and a home worth \$150,000. If the borrower believes that home values will not recover for many years and she has the opportunity to rent an equivalent property for less than her mortgage payment, she may compare the net benefits of maintaining her creditworthiness as a borrower in the future by continuing to pay her mortgage with the net benefits of defaulting on that mortgage or otherwise not paying off her lender in full. (In some states, borrowers remain liable for a portion of unpaid mortgage debt even if they default.) Borrowers who are not underwater can more easily lower their monthly payments by refinancing their mortgages and have no such incentive to default.

Number of Underwater Borrowers. The more than 10 million residential properties underwater at the end of the fourth quarter of 2012 represent 21.5 percent of homes with a mortgage (see Table 2).⁷ The number of underwater borrowers in 2012 is similar to the number at the beginning of the economic recovery (specifically, at the end of the third quarter of 2009), when 11.1 million borrowers (24 percent)

⁶ CoreLogic, *CoreLogic Reports 200,000 More Residential Properties Return to Positive Equity in Fourth Quarter of 2012* (March 19, 2012), www.corelogic.com/research/negative-equity/corelogic-q4-2012-negative-equity-report-press-release.pdf.

⁷ Ibid.

were underwater.⁸ In contrast, the fraction of homes underwater was more than 2 times higher in 2009 than in the 10-year period between 1997 and 2007.⁹

Approximately 1.6 million underwater borrowers were seriously delinquent in the fourth quarter of 2012, CBO estimates. Although those borrowers represent only 15 percent of all underwater borrowers, they constitute nearly 50 percent of all seriously delinquent borrowers.

The GSEs own or guarantee nearly 60 percent of all loans but have a smaller proportion of both loans to underwater borrowers (29 percent) and seriously delinquent loans (28 percent) (see Figure 1). The share of underwater GSE-backed loans that are either eligible for or potentially eligible for a principal forgiveness modification is only 4 percent, CBO estimates, as it excludes both those borrowers with GSE-backed loans who are not underwater (89 percent of all GSE-backed loans) and those underwater borrowers who do not meet one or more of the modification eligibility criteria used in this analysis (7 percent of all GSE-backed loans).

How Do Distressed Borrowers Affect Economic Growth?

CBO attributes about one-third of the slow recovery from the recession that began three years ago to weak overall demand for goods and services in the economy—in particular, fewer purchases by state and local governments (accounting for the largest portion) and fewer purchases by the federal government, less residential investment, and lower consumer spending (each accounting for roughly equal portions).¹⁰ CBO estimates that distressed and underwater mortgage borrowers have contributed to weak consumer spending through at least three channels. First, the value of households' wealth has improved only modestly (compared with gains after past recessions) in the wake of the unusually large drop during the recession; that modest improvement primarily reflects continued weakness in the value of real estate assets. Second, the efforts of some households to pay down debt and resist taking on new debt may have surpassed the typical reaction of household spending to changes in wealth and income.¹¹ Third, concentrated foreclosures on homes of distressed borrowers depress the prices of nearby properties, which appears to amplify the effects of wealth loss in reducing consumption.¹²

⁸ Ibid.

⁹ George R. Carter III, "Housing Units With Negative Equity, 1997 to 2009," *Cityscape*, vol. 14, no. 1 (2012), pp. 149-165, www.huduser.org/portal/periodicals/cityscape/vol14num1/index.html.

¹⁰ Congressional Budget Office, *What Accounts for the Slow Growth of the Economy After the Recession?* (November 2012), www.cbo.gov/publication/43707.

¹¹ For example, see Atif R. Mian, Kamalesh Rao, and Amir Sufi, *Household Balance Sheets, Consumption, and the Economic Slump* (working paper, June 2012), <http://dx.doi.org/10.2139/ssrn.1961211>; and Karen Dynan, "Is a Household Debt Overhang Holding Back Consumption?" *Brookings Papers on Economic Activity* (Spring 2012), pp. 299-344, www.brookings.edu/about/projects/bpea/past-editions.

¹² See Jenny Schuetz, Vicki Been, and Ingrid Gould Ellen, "Neighborhood Effects of Concentrated Mortgage Foreclosures," *Journal of Housing Economics*, vol. 17, no. 4 (December 2008), pp. 307-319, <http://dx.doi.org/10.1016/j.jhe.2008.09.004>; John P. Harding, Eric Rosenblatt, and Vincent W. Yao, "The Contagion Effect of Foreclosed Properties," *Journal of Urban Economics*, vol. 66, no. 3 (November 2009), pp. 164-178, <http://dx.doi.org/10.1016/j.jue.2009.07.003>; and Atif R. Mian, Amir Sufi, and Francesco Trebbi, *House Prices, and the Real Economy* (working paper, May 2012), <http://dx.doi.org/10.2139/ssrn.1722195>.

How Would Principal Forgiveness Affect the GSEs and the Budget?

Fannie Mae and Freddie Mac, two government-sponsored enterprises (referred to throughout this paper as “the GSEs”), set standards for the types of loan modifications mortgage servicers can offer borrowers who miss a scheduled mortgage payment. Before 2007, when the housing crisis began, most delinquencies were resolved without a modification, either through the sale or refinancing of a home. Between 2007 and early 2009, during the early stages of the housing crisis, the GSEs increased their use of modifications to help avert foreclosures, but most of those modifications did not reduce borrowers’ monthly mortgage payment. More recently, the GSEs and others have developed a number of new modification options, including the Home Affordable Modification Program (HAMP), one of the main modification programs used by servicers of loans backed by the GSEs, which provides larger and longer-term payment relief to eligible borrowers. Because, in CBO’s judgment, the federal government effectively owns and controls the GSEs, any gains or losses associated with expanding the available options for distressed borrowers to include principal forgiveness would affect the federal budget.

The Cost-Effectiveness of Principal Forgiveness. The goal of all loan modifications is to reduce the expected default costs of a loan by an amount greater than the value lost by offering a borrower a lower monthly payment. From the borrower’s perspective, principal forgiveness provides both a lower monthly payment and, unlike standard HAMP, an improved equity position as a result of the lower loan balance. Having equity (the difference between the value of the home and what the borrower owes) strengthens borrowers’ ability to avoid default and their incentive to continue to pay the mortgage. Principal forgiveness is cost-effective for an individual loan only if the expected savings from averting a possible foreclosure are large enough to offset the lost value of the principal forgiven. However, principal forgiveness may cost more than other alternatives across an entire portfolio of loans if it is made available to and taken up by too many borrowers for whom standard HAMP would offer a lower-cost modification alternative or who would not have defaulted without the possibility of such forgiveness.

Effects on the Federal Budget. After the U.S. government assumed control of the GSEs in 2008, CBO concluded that the institutions had effectively become government entities whose operations should be included in the federal budget.¹³ Under the terms of that conservatorship, the government has financial responsibilities to the GSEs but also benefits from improvements in their net worth. Thus, the financial performance of the GSEs has an impact on the federal budget, and that performance depends importantly on the GSEs’ management of mortgages in default or at significant risk of default.

CBO produces two primary types of assessments of the budgetary cost of the GSEs. First, it projects the cost of new loans expected to be guaranteed over a 10-year period as part of its report on the economic and budget outlook used in the Congressional budget process. Second, it produces cost estimates of the potential impact of changes to current law on either the existing portfolio of loans owned or guaranteed by the GSEs or new loans expected to be guaranteed over the 10-year budget window.

How and when CBO would estimate the budgetary impact of a change in the GSEs’ approach to loan modifications under HAMP would depend on how such a change was adopted. If changes were

¹³ For a description of CBO’s budgetary treatment of the GSEs, see Congressional Budget Office, *CBO’s Budgetary Treatment of Fannie Mae and Freddie Mac* (January 2010), www.cbo.gov/publication/41887.

implemented as the result of an administrative action by the Federal Housing Finance Agency (the conservator of the GSEs, which oversees all aspects of their operations), CBO would reflect that action in its next set of 10-year baseline projections. In contrast, if the changes were mandated by legislation, CBO would report, in a cost estimate for the legislation, any change in the estimated cost of GSE-insured loans from the change in policy and subsequently incorporate that estimate in its baseline projections.

The Office of Management and Budget (OMB) treats the GSEs as outside the budget, and it records and projects their budgetary cost on the basis of the cash transfers and dividend payments generated under the terms of the Senior Preferred Stock Purchase Agreements entered into with the Department of the Treasury in 2008.¹⁴ As a result, the Administration has not included in its budget figures costs that would be directly comparable to CBO's estimates of budgetary costs. In addition, the changes to HAMP analyzed by CBO, whether mandated by legislation or administrative action, would probably cause the projected cash flows received by the GSEs on existing loans to change and would, therefore, affect OMB's estimates of the budgetary impact of the GSEs.

Current Policy and Options

CBO's analysis contrasts the costs and impact on borrowers of the current policy of HAMP with three options augmenting HAMP with a principal forgiveness modification. Each of those options would reach a target level of payment reduction or loan balance through different mechanisms and would involve a variety of other design choices (about which CBO made certain assumptions in order to estimate the effects of the options).

Each policy option analyzed by CBO could be implemented under current law on the basis of FHFA's authority as conservator of the GSEs. As such, the GSEs and FHFA could make an administrative change to implement one of the policy options. Alternatively, the Congress could write legislation to direct the GSEs to adopt a certain option.

Approaches the GSEs and Others Have Used to Manage Mortgage Delinquency and Foreclosure

Federal policymakers and industry participants have developed various approaches to reduce the costs and disruptions of foreclosure proceedings, which can end with borrower eviction and sale of the property at auction. Some of those approaches focus on keeping borrowers in their homes, and others focus on transitioning borrowers out of their homes. Both types of approaches provide incentives from the government to servicers (say, a bank that originated the mortgage and then sold it to the GSEs but remained as the point of contact with the borrower for making payments) to take actions designed to reduce costs to the government, because servicers are largely insulated from the costs of foreclosures by the GSEs. One particular approach that focuses on keeping borrowers in their homes is principal forgiveness, which can reduce payment delinquency but also raises other concerns.

¹⁴ For the current Senior Preferred Stock Purchase Agreements for Fannie Mae and Freddie Mac, see www.fhfa.gov/Default.aspx?Page=364.

Approaches Keeping Borrowers in Their Homes. If modifications to a mortgage result in payments from the borrower, they can reduce the present value of the government's cost in comparison to such costs under foreclosure. The most important program supporting such modifications for distressed borrowers is HAMP, administered by the Treasury. HAMP specifies a method to lower a borrower's monthly payment (by reducing the interest rate, extending the loan's duration, or offering principal forbearance) and provides incentive payments to mortgage holders and servicers to implement the modifications. As of November 2012, more than 560,000 permanent HAMP modifications have been started on first mortgages for GSE-backed loans, representing nearly 2 percent of the 28 million loans serviced on behalf of the enterprises.¹⁵

An alternative solution for borrowers who owe more than the current value of their homes (that is, those with "negative equity") looking for payment relief is to refinance their existing mortgages into loans with lower monthly payments. Approximately 15 percent of the 15 million loans refinanced by the GSEs since April 2009 were originated under the Home Affordable Refinance Program (HARP), which helps borrowers who are unable to receive a traditional refinancing because of house price declines.¹⁶ HARP allows borrowers with negative equity to refinance and provides cost savings and streamlining with respect to private mortgage insurance, underwriting requirements, and property valuations.¹⁷

A key distinction between a loan modification and a refinancing is that the GSEs generally require borrowers to be current on their existing loans to be eligible for a refinancing, whereas HAMP rules require that borrowers must often be delinquent or show signs of distress to receive a loan modification. As a result, the different options have different target populations of borrowers and consequences for the timing and size of the GSEs' costs to the government.¹⁸

Approaches Transitioning Borrowers from Their Homes. In collaboration with the government, the GSEs have designed a number of programs that provide borrowers with ways to leave their homes through means other than foreclosure. In one approach, a short sale, the borrower arranges for an arms-length sale of the home at a price lower than the outstanding balance of the mortgage. In another approach, known as a "deed-in-lieu," the borrower cedes ownership of the home to the owner of the mortgage in exchange for being released from the mortgage obligation; sometimes the borrower then

¹⁵ Federal Housing Finance Agency, *Foreclosure Prevention Report* (November 2012).

¹⁶ Federal Housing Finance Agency, *Refinance Report* (December 2012).

¹⁷ With a traditional GSE refinance, borrowers are usually required to obtain private mortgage insurance (PMI) for loans with a LTV ratio greater than 80 percent. That coverage is based on the current LTV ratio, and it increases (in terms of both the amount of coverage and the cost to the borrower) as the LTV ratio increases. Under HARP, PMI requirements are waived if the original loan did not require insurance (even if the current LTV ratio is greater than 80 percent). In addition, borrowers are not required to obtain additional insurance coverage if the value of their home has declined and the current LTV would require more coverage than was required on the original loan.

¹⁸ For a description of potential budgetary costs for refinancing programs, see Congressional Budget Office, *An Evaluation of Large-Scale Mortgage Refinancing Programs*, CBO Working Paper 2011-4 (September 2011), www.cbo.gov/publication/42752.

rents the home instead of leaving. Since 2008, the GSEs have completed close to 440,000 actions of those two types; more than half have occurred since the start of 2011.¹⁹

Approaches Using Principal Forgiveness. Modifications for delinquent borrowers with non-GSE mortgages have increasingly used principal forgiveness. Thirty-eight percent of modified loans owned by private investors and held on banks' balance sheets were provided some amount of principal forgiveness in the third quarter of 2012.²⁰ Those percentages are up from the fourth quarter of 2010, when private investors and banks used principal reductions on 2 percent and 18 percent of loans, respectively.²¹ Some portion of that increased use of principal forgiveness is related to HAMP PRA. Incentive payments made by the Treasury, based on the delinquency status of the borrower and the LTV ratio before modification, reimbursed investors from 18 cents to 63 cents per dollar of principal forgiven. Since HAMP PRA's inception, servicers have started nearly 120,000 permanent principal forgiveness modifications, forgiving a median amount of nearly \$68,000 per loan.²² To date, FHFA has not used principal forgiveness to lower GSE-backed mortgages, concluding that principal forgiveness does not achieve the agency's goals of minimizing losses to the government and supporting the mortgage market as effectively as other options available to borrowers with GSE-backed loans.

Concerns About Principal Forgiveness. The primary factors behind FHFA's opposition to principal forgiveness for GSE-backed loans are possible costs from delinquencies that would not occur without principal forgiveness, questions over fairness, and potentially high operational and technical costs.²³

Moral Hazard. Moral hazard is a tendency for people to be more willing to take risks for which the potential costs or burdens will be borne in whole or in part by others. If borrowers become delinquent in order to gain access to a principal forgiveness modification—a form of moral hazard—then the cost of principal reduction increases. For example, borrowers may know that they are very unlikely to default on their mortgages because they have access to funds that the lender does not know about. Under those circumstances, offering principal forgiveness to those borrowers, which generates a cost to the GSEs from the principal reduction but little to no offsetting benefit from reducing the likelihood of default, results only in an increase in expected costs to the GSEs.

Several approaches to program design would address concerns about the costs stemming from moral hazard. The most effective approach would be to offer principal forgiveness only to borrowers who were

¹⁹ Federal Housing Finance Agency, *Foreclosure Prevention Report* (November 2012).

²⁰ Office of the Comptroller of the Currency, *OCC Mortgage Metrics Report: Third Quarter 2012* (December 2012), [www.occ.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-2012/mortgage-metrics-q3-2012.pdf](http://www OCC.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-2012/mortgage-metrics-q3-2012.pdf).

²¹ Office of the Comptroller of the Currency, *OCC Mortgage Metrics Report: Fourth Quarter 2010* (March 2011), www.occ.treas.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-2010/mortgage-metrics-q4-2010.pdf.

²² Department of the Treasury, *Making Home Affordable Program Performance Report* (December 2012).

²³ Federal Housing Finance Agency, *Review of Options Available for Underwater Borrowers and Principal Forgiveness* (July 2012), www.fhfa.gov/Default.aspx?Page=403.

delinquent at the time the program was announced, excluding borrowers who become delinquent in order to receive principal forgiveness.

Although FHFA's economic analysis shows a slight benefit to the government from introducing principal forgiveness for GSE-backed loans, the benefit in that analysis disappears if 0.2 percent to 1.3 percent of underwater borrowers with GSE-backed loans who have not missed a mortgage payment opt to do so in order to receive principal forgiveness.²⁴ That concern, combined with uncertainty surrounding the extent to which borrowers' behavior will improve under principal forgiveness relative to under existing GSE loss-mitigation programs, is a key element in FHFA's decision not to support principal forgiveness for the GSEs to date.

Fairness. FHFA also expressed concern that allowing principal forgiveness on existing GSE loans may raise mortgage rates or reduce credit availability for future borrowers, as mortgage investors seek compensation for the potential that principal forgiveness may be used in subsequent housing crises.²⁵

In addition to FHFA's concern, principal forgiveness, like other government programs offering concessions to underwater borrowers in financial distress, provides a benefit from the government to people who own a home worth less than the amount owed on the mortgage. On the one hand, principal forgiveness provides a form of insurance to people who experience dramatic declines in wealth because of changes in housing prices unrelated to the condition of their property. Such transfers are similar in some respects to emergency unemployment benefits, which have provided additional weeks of income replacement to eligible workers who have been laid off. On the other hand, principal forgiveness potentially transfers resources from general revenues raised from renters and owners to people who may have purchased a more expensive home than they could afford or who may have chosen to strategically default.

Operational Considerations. Because the GSEs have not implemented principal forgiveness, doing so would involve costs for updating existing systems, developing new processes and controls, and creating new procedures for both employees and servicers. On the basis of estimates provided by Fannie Mae and Freddie Mac, the implementation costs of those changes would range from \$70 million to \$90 million and take up to one year to complete.²⁶

FHFA also cited potential indirect costs associated with principal forgiveness; those costs would arise from the need to divert the attention of management and key employees from other, potentially valuable projects. Those projects, FHFA has argued, could result in greater savings for the government than the savings expected from principal forgiveness.

Options for Incorporating Principal Forgiveness in GSE Modifications

CBO analyzed options under which the GSEs would select for each eligible borrower a standard HAMP modification or a modification that includes principal forgiveness, depending on which one lowered the

²⁴ Ibid.

²⁵ Ibid.

²⁶ Ibid.

government's expected costs more. Offering principal forgiveness in addition to standard HAMP would probably be more effective in reducing costs to the government than replacing standard HAMP with principal forgiveness, CBO estimates. By augmenting standard HAMP with some form of principal forgiveness, the GSEs could select either option for a particular borrower on the basis of an evaluation that could be designed to minimize costs to the government. However, that approach would burden the GSEs and servicers with choosing between HAMP and a principal forgiveness alternative for each borrower instead of putting the borrower through a single streamlined program.

The options CBO considered were:

- *Option 1.* GSEs choose between standard HAMP and the HAMP Principal Reduction Alternative;
- *Option 2.* GSEs choose between standard HAMP and principal forgiveness to reduce the outstanding loan balance to 100 percent of a home's current assessed value; and
- *Option 3.* GSEs choose between standard HAMP and principal forgiveness to reduce the outstanding loan balance to 90 percent of a home's current assessed value.

In Option 1, HAMP PRA (not being used currently by the GSEs) would be offered to borrowers for whom the GSEs deemed it would be beneficial. HAMP PRA incorporates principal forgiveness as one of the first steps to achieve the same target monthly mortgage payment as under standard HAMP. In both programs, the initial step adds missed payments to the outstanding amount owed by the borrower. However, under HAMP PRA the next step in the modification process reduces the principal amount owed to a floor of 115 percent of a home's current value.²⁷ Unlike the forbearance that is used as one of the steps in standard HAMP, the principal reduction under HAMP PRA is truly forgiven, permanently reducing the amount owed by borrowers as long as they remain current on the modified loan. If the target payment is not achieved once the amount of principal has been reduced, the mortgage servicer implements standard HAMP procedures, starting with an interest rate reduction, to complete the modification.

In Options 2 and 3, borrowers would be granted larger reductions in principal than those granted under HAMP PRA. In Option 2, all negative equity would be forgiven, resulting in a new loan balance equal to the assessed value of the home. In Option 3, principal would be forgiven until the loan balance was equal to 90 percent of the assessed value of the home, generating positive equity for the borrower. Analyzing those three options allows for an assessment of the impact of the amount of forgiveness on borrowers' behavior and budgetary costs. In Options 2 and 3, borrowers would have their interest rate set to 5 percent and their mortgage term set to 30 years in addition to the principal forgiveness granted as part of the modification. (For the advantages and disadvantages of Options 1, 2, and 3 involving principal forgiveness, see Table 3.)

²⁷ Servicers may reduce the principal balance of loans below 115 percent and receive incentive payments for reductions to as low as 105 percent. However, the HAMP PRA alternative waterfall described in the program documentation is based on a reduction to 115 percent. See Department of the Treasury, *Making Home Affordable Program Supplemental Directive 10-05* (June 3, 2010).

To implement principal forgiveness, policymakers or FHFA would need to make decisions that would have a significant impact on participation and the projected budgetary cost. In addition to deciding the amount of principal to forgive, policymakers or FHFA would need to make a number of decisions about eligibility—in particular, how to minimize the cost of additional participation by borrowers who are not currently in distress, the extent to which borrowers must be delinquent on their payments to qualify, whether to include nonowner occupants, and what threshold to use for credit scores. Issues related to prepayment or default on the modified loan, and operational costs for the GSEs, would also need to be addressed. To conduct this analysis, CBO made assumptions about all of those issues. (See Table 4 and Appendix A for more details on design considerations. Appendix B describes the shared appreciation modification, a design consideration CBO did not include in its analysis.) Variations from those assumptions would lead to different costs and other effects.

CBO's Analytic Approach

Determining the budgetary costs or savings from implementing a policy option incorporating principal forgiveness requires two key steps. First, the cost for each borrower who receives a modification must be calculated. Second, the size and composition of the portfolio of eligible borrowers must be estimated, including the likelihood that borrowers with a certain set of characteristics would choose to participate in a principal forgiveness modification program.

Calculating Budgetary Costs for Particular Loans

CBO projects the budgetary cost to the government of an existing GSE loan, also known as the subsidy cost, as the present value of the amount expected to be paid out to holders of the guarantee, minus the amount GSEs receive from the sale of a foreclosed property or any insurance on the mortgage (as many borrowers with low down payments were required to purchase private mortgage insurance), minus the amount of fees collected prior to default charged for providing the guarantee. That value expresses the flows of current and future income or payments in terms of a single number, equivalent to a lump sum received or paid today; the present value depends on the discount rate (or rate of interest) that is used to translate future cash flows into current dollars. For example, if the GSEs expect to pay investors holding a guarantee \$50,000 (on a present-value basis), receive no mortgage insurance, and collect \$40,000 in sales proceeds and fees (on a present-value basis), then the budgetary cost for that mortgage would be \$10,000 (see Appendix C for more details on the subsidy cost calculation).

In addition to the costs incurred by the GSEs, a change in modification policy may result in additional losses on mortgage-backed securities (MBSs) held in portfolios by the GSEs, the Treasury, and the Federal Reserve. A loss is incurred by those federal MBS investors when delinquent loans are pulled out of the mortgage pool for modification, triggering a partial repayment of the MBSs that pays an interest coupon above market rates.

To capture differences in the behavior, costs, and risks associated with different borrowers in a tractable way, CBO classified the population of borrowers eligible for a modification according to risk categories that affect borrowers' propensity to default. Each group is characterized by the following variables (as measured at the time of the modification):

- Current loan-to-value ratio;

- Credit score—calculated using models developed by Fair Isaac Corporation (FICO);
- Number of days delinquent; and
- Mortgage debt-to-income (DTI) ratio—the percentage of income that goes toward housing costs, including mortgage principal and interest, hazard insurance premiums, property taxes, and (when applicable) mortgage insurance premiums and homeowners' association dues.

All other characteristics, including the type of property, occupancy status, and property location, are assumed to be consistent across all borrowers.

Eligible Borrowers and Participation

To estimate effects on costs and other outcomes for the GSEs' loans, CBO first identified a population of loans that could be affected by the options. Approximately \$608 billion of the GSEs' portfolio of single-family loans, or 3.0 million borrowers based on an average loan size of \$200,000, had a current LTV ratio greater than 100 percent as of December 31, 2012. Of that population, CBO estimated 610,000 borrowers already are or, over the assumed two-year period of the program, would become delinquent and would meet all other eligibility criteria for HAMP under current policy and, under a change in policy, an additional 550,000 borrowers will meet all HAMP eligibility criteria except for being in financial distress (defined as being delinquent or at reasonable risk of becoming delinquent).

Although HAMP is set to expire on December 31, 2013, CBO's analysis is based on modifications that would be performed over a two-year period after the GSEs had implemented a principal forgiveness modification program. For the purposes of comparison, "current policy" in this analysis reflects the assumption that the GSEs will continue to offer loan modifications that lower the monthly payments of eligible borrowers in a manner consistent with HAMP for at least one additional year beyond 2013.

HAMP-Eligible Borrowers. Not every underwater borrower would qualify for a modification. To be eligible for standard HAMP, borrowers must be delinquent (or be able to provide evidence of financial distress) and meet established program criteria (including occupancy restrictions). In addition, the modification must reduce the costs to the GSEs relative to the costs of other loss-mitigation options according to a net-present-value test. For its analysis, CBO estimates that 20 percent of underwater borrowers would meet those eligibility criteria, meaning approximately 610,000 loans with an unpaid principal balance of \$122 billion would qualify for a principal forgiveness modification using the same eligibility criteria as standard HAMP. (See Appendix C for a detailed description of the characteristics, eligibility, and participation estimates for HAMP-eligible and potentially HAMP-eligible borrowers.)

Based on the current population of eligible, underwater borrowers with GSE-backed loans and those expected to become eligible under current policy, CBO expects that the GSEs would be willing to offer HAMP modifications on those 610,000 loans. However, modification programs rarely reach the entire population of eligible borrowers, as some borrowers are unwilling (because of the complexity of the process or concerns such as the potential negative impact on their credit score) to complete the modification process. As such, CBO's analysis of a scenario in which borrowers are offered only standard HAMP and scenarios in which they are offered one of the three modifications using principal forgiveness assumes that some proportion of those eligible borrowers would receive a modification and some would not.

CBO's estimates of participation incorporate borrowers' reactions based on the size of the payment reduction they would receive. That concession takes two forms: a reduction in a borrower's monthly DTI ratio and a reduction in the loan balance. Larger concessions on either dimension would create higher participation rates, CBO predicts.

Under standard HAMP, in which borrowers receive only a reduction in their monthly DTI ratio, CBO estimates that nearly 40 percent of eligible loans (representing 227,000 borrowers and \$45 billion in unpaid principal) will be modified. Under HAMP PRA, in which borrowers receive the same reduction in their DTI ratio as under standard HAMP but also receive a reduction in their loan balance, CBO expects participation would be approximately 13 percent higher than under standard HAMP. For programs that offer principal forgiveness to 100 percent and 90 percent, expected participation rates relative to standard HAMP depend on the balance between reductions in DTI ratios and reductions in LTV ratios created by the modification. For borrowers who receive a modified DTI ratio of less than 31 percent and some principal forgiveness, CBO projects that participation in principal forgiveness programs would exceed participation in HAMP. In cases in which principal is forgiven but the postmodification DTI ratio still exceeds 31 percent, expected participation could be greater than or less than under HAMP. In total, CBO expects that participation in programs that offer principal forgiveness to 100 percent LTV would exceed HAMP participation by 11 percent and that participation in programs that offer principal forgiveness to 90 percent LTV would exceed HAMP participation by 25 percent.

Potentially HAMP-Eligible Borrowers. Some population of underwater borrowers who are not expected to become eligible for HAMP under current policy may, under a change in policy, be induced to become delinquent and therefore qualify for a principal forgiveness modification. Although the size of that population is highly uncertain, CBO estimates that an additional 18 percent of the population of underwater borrowers (representing 550,000 loans and \$110 billion in unpaid principal) could become eligible for a principal forgiveness modification under the same eligibility criteria as standard HAMP by becoming delinquent immediately.

In addition, CBO estimates that the population of borrowers seeking a principal forgiveness modification from outside the HAMP-eligible population would have a higher average credit profile (based on DTI and LTV ratios and credit scores) than the HAMP-eligible population, which is consistent with studies on borrowers' behavior associated with the announcement of other modification programs.²⁸

Finally, CBO estimates that participation by potentially HAMP-eligible borrowers would depend on the size of the payment reduction they would receive, with an adjustment to reflect that those borrowers have chosen not to participate in standard HAMP in spite of the payment reduction they would have received. As a result, participation in standard HAMP is set to zero and participation in each of the principal forgiveness modifications is set equal to the incremental participation expected on the basis of the size of the reduction offered relative to standard HAMP.

²⁸ See Christopher Mayer and others, *Mortgage Modification and Strategic Behavior: Evidence from a Legal Settlement with Countrywide*, Working Paper 17065 (National Bureau of Economic Research, May 2011), www.nber.org/papers/w17065; and Laurie Goodman and others, *Modification Effectiveness: The Private Label Experience and Their Public Policy Implications* (report prepared by Amherst Securities Group for the Pew Charitable Trusts, May 30, 2012).

Comparing Loan Modifications for Particular Borrowers

For each group of borrowers and for each modification approach (no modification, standard HAMP, HAMP PRA, principal forgiveness to 100 percent LTV, and principal forgiveness to 90 percent LTV), CBO estimated borrowers' default rates and subsidy costs. To illustrate the variation in outcomes across the modification approaches, CBO considered a borrower who, without a loan modification, has a \$200,000 loan balance, 6 percent interest rate, 160 percent LTV ratio, 60 percent DTI ratio, credit score of 660, and 60 days of delinquent payments (see Table 5 and Figure 2). That illustrative borrower's LTV ratio, DTI ratio, credit score, and number of days of delinquent payments represent the approximate midpoint of the range of values analyzed by CBO rather than those of a representative eligible borrower. As such, because the cost of each modification varies considerably with the characteristics of the borrowers and loans within each group, it is the mix of eligible borrowers who participate that ultimately determines the relative cost of each policy.

In CBO's analysis, the reduction in postmodification DTI and LTV ratios is the key driver for improving borrowers' performance on the modified loan. The relative subsidy costs per borrower of different modifications are determined by the changes in default losses created by the modification and the cost to the GSEs of the payment relief offered to the borrower. The structure of that payment relief is an important factor, as different types of concessions yield different changes in default losses and different costs to the GSEs, even when the borrower is left with the same postmodification monthly payment.

No HAMP Modification

If they do not receive a HAMP modification, borrowers with a \$200,000 loan balance and interest rate of 6 percent will continue to owe a monthly payment of \$1,199. Because many of those borrowers are either delinquent on their loan or considered at risk of default, expected default rates without a modification are high. For the illustrative borrower with a 160 percent LTV ratio, 60 percent DTI ratio, and credit score of 660, the expected default rate is 80 percent after one year, rising to 97 percent after three years. Across the entire population of loans analyzed by CBO, approximately 35 percent are expected to default in one year and more than 50 percent are expected to default by the end of three years. Those default rates increase for borrowers with higher current LTV and DTI ratios or lower current credit scores.

Standard HAMP

Under HAMP, the payment reduction that borrowers receive is determined by their premodification DTI ratio. For example, borrowers with a premodification DTI ratio of 60 percent would have their monthly payment reduced by \$570 (from \$1,199 premodification to \$629 postmodification on a \$200,000 loan). The structure of the modification also varies, as different steps in the HAMP waterfall are required for different premodification DTI ratios to bring borrowers down to a 31 percent postmodification ratio. For borrowers with a starting DTI ratio of 60 percent, the postmodification target DTI ratio is reached by reducing their interest rate to the floor of 2 percent and extending their loan term to 453 months.

Default rates are lower under standard HAMP than under a policy of no modification, particularly in the years immediately following a payment reduction. (Default rates after one year are projected to be more than 60 percentage points lower, CBO estimates.) Over time, however, the difference in default rates narrows, according to CBO's simulation, as the impact of high annual default rates under HAMP causes

total defaults to continue to accumulate, and total defaults for borrowers not receiving a modification slow as there are fewer borrowers left to default after the first few years.

Finally, subsidy costs to the GSEs increase by offering HAMP modifications to borrowers who do not show a large enough improvement in expected defaults to offset the costs incurred by offering a lower monthly payment. For example, the subsidy cost for the illustrative borrower described above increases by nearly \$11,000 under standard HAMP relative to the cost under no modification. Other borrowers, particularly those with lower premodification DTI ratios and higher LTV ratios, will show a smaller increase or even a subsidy cost decrease under HAMP, CBO estimates.

HAMP Principal Reduction Alternative

In the case of HAMP PRA, borrowers would receive the same postmodification monthly payment as under standard HAMP for each premodification DTI ratio. Unlike HAMP, however, the structure of that payment relief would differ depending on the borrower's premodification LTV ratio. Borrowers with a premodification LTV ratio of less than 115 percent, which is already below the HAMP PRA target, would receive a modification identical to standard HAMP across all premodification DTI buckets. For higher LTV ratios, principal forgiveness would play a larger role in reducing the borrower's monthly payment to 31 percent DTI. For example, borrowers with a premodification DTI ratio of 60 percent and an LTV of 160 percent would receive both principal forgiveness and an interest rate reduction, but not the term extension required under standard HAMP.

HAMP PRA would reduce expected defaults relative to standard HAMP for all borrowers with a premodification LTV ratio greater than 115 percent, CBO estimates, as borrowers respond to both a lower monthly payment and increased equity. Those improvements would be relatively modest one year after the modification but would grow over time as expected defaults for standard HAMP borrowers, who received no reduction in their loan balance, accumulate.

HAMP PRA would lower costs to the government relative to standard HAMP for the illustrative borrower and other borrowers who show a large enough improvement in expected default costs to cover the amount of principal forgiven. In most cases, the advantage of HAMP PRA decreases as the LTV ratio decreases, as those less distressed borrowers perform well on their loans even without the principal forgiveness concession provided under HAMP PRA. As the LTV ratio increases, however, HAMP PRA would have an advantage, CBO estimates, as the combination of principal forgiveness, interest rate reductions, and term extensions reduced default costs more than interest rate and term changes alone.

Principal Forgiveness to 100 Percent of Home Value

For principal forgiveness down to 100 percent LTV, the size of the borrower's monthly payment reduction would be determined by his or her premodification LTV ratio, so that borrowers with a higher current LTV ratio would receive the largest reduction. For example, borrowers with a premodification LTV ratio of 160 percent and a DTI ratio of 60 percent would receive a postmodification monthly payment of \$671 (a reduction of \$528) for a \$200,000 loan, which exceeds the payment they would receive under either HAMP or HAMP PRA. In some cases, principal forgiveness to 100 percent might reduce the postmodification payment and DTI ratio below the HAMP payment based on a target DTI ratio of 31 percent.

Unlike standard HAMP, in which the size of a borrower's payment reduction is independent of his or her LTV ratio, the amount of the payment reduction would increase as the premodification LTV ratio increased under principal forgiveness to 100 percent. As a result, the reduction in expected defaults under principal forgiveness to 100 percent LTV relative to HAMP would increase as the premodification LTV increased. At a premodification DTI ratio of 60 percent and LTV ratio of 120 percent, for example, CBO estimates that expected defaults under principal forgiveness to 100 percent would exceed those under HAMP after one year, as the borrower would receive a larger reduction in his or her monthly payment under HAMP. At a premodification DTI ratio of 60 percent and LTV ratio of 200 percent, however, expected defaults under HAMP after one year would be much higher than those under principal forgiveness to 100 percent LTV, in which case both the borrower's payment and the mortgage balance are cut in half.

Principal forgiveness to 100 percent LTV would be less costly than standard HAMP for a borrower with a 160 percent LTV ratio, 60 percent DTI ratio, and credit score of 660 and for many other groups of borrowers. Even at the highest levels of current LTVs, for which the amount of principal forgiven is greatest, the reduction in default costs for borrowers is often large enough to offer an improvement over HAMP.

Principal Forgiveness to 90 Percent of Home Value

Principal forgiveness to 90 percent LTV would produce similar results relative to standard HAMP to the alternative of reducing principal to 100 percent of a home's current value. The main difference is that a larger reduction in the loan balance would yield a larger reduction in monthly payments and more positive equity, both of which would serve to lower defaults relative to principal forgiveness to 100 percent. For example, borrowers with a premodification LTV ratio of 160 percent would receive more principal reduction (\$87,500 versus \$75,000 for principal forgiveness to 100 percent) and a smaller monthly payment (\$604 versus \$671 for principal forgiveness to 100 percent) under principal forgiveness to 90 percent. Both factors would serve to drive defaults lower because of the larger reduction in postmodification LTV.

Like principal forgiveness to 100 percent, principal forgiveness to 90 percent LTV would be less costly than standard HAMP for the illustrative borrower and many other groups of borrowers.

Total Budgetary Costs and Impact on Borrowers

The net costs of the options relative to current policy capture the differences in the costs per borrower and the rates of participation in the populations of eligible and potentially eligible borrowers. CBO evaluates the impact on borrowers by comparing the expected numbers of modifications and defaults. For those effects, CBO reports central estimates (which use the agency's best estimates of values for key parameters of relevant economic behavior) and ranges based on alternative assumptions.

CBO's Central Estimates

CBO examined the costs and impact on borrowers of standard HAMP (current policy) and the three options.

- *Standard HAMP.* Offering HAMP alone will result in 227,000 modifications and expected defaults of 599,000, CBO projects (see Table 6).
- *Option 1: Standard HAMP or HAMP Principal Reduction Alternative.* Combining HAMP PRA with standard HAMP would generate 29,000 additional modifications and avert 18,000 defaults, generating expected savings to the government of \$0.16 billion.
- *Option 2: Standard HAMP or Principal Forgiveness to 100 Percent of a Home's Value.* HAMP offered in tandem with principal forgiveness to 100 percent LTV would produce 26,000 more modifications than HAMP alone and reduce defaults by 43,000. That combination would generate savings to the government of \$2.77 billion.
- *Option 3: Standard HAMP or Principal Forgiveness to 90 Percent of a Home's Value.* The combination of standard HAMP and principal forgiveness to 90 percent LTV would increase modifications by 57,000 and reduce defaults by nearly 95,000 when compared with standard HAMP. Savings to the government under this option would be \$2.21 billion, CBO estimates.

In all three options, the combination of standard HAMP and principal forgiveness would result in a lower cost to the government than offering either modification program alone, CBO estimates. In addition to reducing costs, augmenting HAMP with principal forgiveness and providing the GSEs with control over which option a borrower is offered would act as a mitigant to participation by borrowers who would increase the cost to the GSEs relative to receiving no modification. Because borrowers would be uncertain whether they would receive a principal forgiveness modification or a standard HAMP modification, relatively few additional borrowers would be willing to risk the potential negative effects of becoming delinquent to qualify for that modification. In addition, borrowers who would make themselves eligible for HAMP by becoming delinquent would only receive a principal forgiveness modification if offering that option lowered expected costs to the GSEs relative to HAMP. CBO expects that given the observable characteristics of borrowers and their loans, most borrowers in this population would be offered HAMP modifications without principal forgiveness. Approximately 7,000 of such borrowers, or slightly more than 1 percent of the total population of borrowers, would receive a principal forgiveness modification under Option 1, CBO estimates. Those numbers increase to 12,000 borrowers (or 2 percent) for Option 2 but fall to 5,000 borrowers (or 1 percent) for Option 3.

As an alternative to having the GSEs choose the type of modification offered, the program could be designed to allow eligible borrowers to select the type of modification they would receive (see Table 7). That approach would increase borrower participation and reduce foreclosures but would boost costs to the government relative to CBO's central estimate. A larger proportion of the potentially eligible population would receive principal forgiveness modifications, and those loans would impose a small cost relative to costs under standard HAMP. Under Option 3, for example, 85,000 potentially HAMP-eligible borrowers would opt for a principal forgiveness modification to 90 percent of their home's current value. As a result, costs to the government would increase by \$2.9 billion relative to CBO's central estimate when the GSEs choose the type of modification offered, or \$0.7 billion compared with costs under current policy.

Effects of Additional Participation Induced by Principal Forgiveness

Every loan group in CBO's analysis generates some expected cost to the GSEs if it is not modified. Introduction of a program of principal forgiveness, which induces additional borrowers to participate,

changes that expected cost. In some cases, modifying the loan amount may lower the expected cost to the GSEs. For example, some borrowers have a very high expected default rate and, therefore, very high expected cost of default. Inducing those borrowers to seek a modification will reduce costs to the GSEs if the reduction in expected default costs exceeds the cost of the payment reduction granted to the borrower as a part of the modification.

In other cases, allowing new borrowers to participate in the program may raise the expected cost to the GSEs. For example, some borrowers have a very low expected default rate and, therefore, very low expected cost of default. Inducing those borrowers to seek a modification will do little to reduce their already low expected default cost. It will, however, raise the expected cost of the loan because the GSEs will bear the cost of the payment reduction granted as a part of that modification.

Moral hazard, whereby borrowers might become delinquent in order to obtain principal forgiveness but would not have done so in the absence of the program, is one form of costly participation. For example, borrowers may know that they are very unlikely to default on their mortgage because they have access to funds that the lender does not know about. Under those circumstances, offering principal forgiveness to those borrowers results only in an increase in expected costs to the GSEs because the principal reduction offers little to no offsetting benefit from reducing the likelihood of default.

In CBO's analysis, the HAMP-eligible and potentially HAMP-eligible populations have borrowers of both types: those for whom a modification would raise expected costs to the GSEs, and those for whom it would reduce expected costs. That finding is in contrast to the analysis by FHFA, which treats all additional participants as costly because of moral hazard. The potentially HAMP-eligible population, with its better average credit profile and lower expected default costs without a modification, has a greater proportion of borrowers for whom a principal forgiveness modification would raise expected default costs relative to no modification. However, for the central estimate CBO assumed that those borrowers would be offered a principal forgiveness modification only if that modification lowered expected costs relative to HAMP. (Potentially eligible borrowers who did not pass that test do not receive any modification.) That test reduces the cost of offering principal forgiveness to the potentially HAMP-eligible population. The HAMP eligibility requirements, which are assumed to also apply to principal forgiveness modifications and hence restrict eligibility to borrowers who are, on average, more distressed than the entire population of underwater borrowers, contributes to that result.

Analysis Under Alternative Assumptions

CBO's estimates of borrowers' defaults and costs to the government may be significantly higher or lower than CBO's central estimate because of the lack of historical data or experience dealing with distressed mortgages on a large scale and the inherent uncertainties in estimating the likely response of borrowers to mortgage modifications. CBO's statistical models were developed using data from performing and nonperforming mortgage loans over a long period of time. Although CBO adjusted those models to attempt to capture borrowers' response to HAMP, the models still may not completely reflect how borrowers react in dealing with a modified loan. Furthermore, the only evidence on the response of borrowers to principal forgiveness comes from non-GSE loans, which may not be representative of the response among borrowers on GSE-backed loans.

The following concerns may be particularly important:

- Potentially HAMP-eligible borrowers may be more or less likely to default to become eligible for principal forgiveness than CBO's models predict;
- Defaults by borrowers may be more or less sensitive to changes in monthly payment (as measured by the postmodification DTI ratio) than CBO's models predict;
- Defaults by borrowers may be more or less sensitive to LTV ratios than CBO's models predict; and
- The market risk premium, a measure of the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk), may be higher or lower than CBO estimates.

To assess the potential impact of those concerns, CBO recalculated the total subsidy cost for each scenario (standard HAMP and the three policy options combining HAMP and principal forgiveness) under a range of conditions that differ from those in CBO's central estimate (see Table 8 for a summary of the range of estimates and Appendix D for a description of the specific sensitivity tests CBO performed and more detailed estimates). To the extent possible, CBO chose values for alternative parameters that encompassed the range of opinion of outside experts on what those parameters might be.

This sensitivity analysis points to three main conclusions:

- Expected defaults and total budgetary costs are quite sensitive to modeling assumptions, particularly with respect to borrowers' sensitivity to LTV ratios and investors' sensitivity to market risk. Adjusting those sensitivities yields subsidy costs that are nearly \$10 billion above or below CBO's central estimate, creating a total range of nearly \$20 billion for each scenario.
- The improvement in expected defaults created by principal forgiveness compared with standard HAMP is robust across all changes to modeling assumptions.
- Options 2 and 3 result in savings relative to standard HAMP under nearly the entire range of conditions tested here, indicating that the expected improvement in budgetary costs offered by a combination of HAMP and certain forms of principal forgiveness is fairly robust across the range of alternative assumptions analyzed by CBO.

The one sensitivity test that generated a cost to the government for principal forgiveness (relative to current policy) was the assessment of potential moral hazard, or whether borrowers who would not default without the introduction of principal forgiveness would do so in order to participate in such a program. As a part of that test, CBO made two adjustments to its central estimate:

- Potentially HAMP-eligible borrowers were assumed to be less likely to default in the absence of a modification; and
- Potentially HAMP-eligible borrowers were assumed to be more likely to participate in principal forgiveness once it was made available to them.

Based on that approach, decreasing expected defaults for potentially HAMP-eligible borrowers alone reduces but does not eliminate budgetary savings associated with augmenting standard HAMP with principal forgiveness under Options 1, 2, and 3 (see Table 9). If that default rate reduction is combined with an expectation that the GSEs are not as effective at assigning borrowers to the lowest-cost modification (specifically, that effectiveness would be as low as when borrowers select the type of modification they would receive), savings to the government are further reduced. If those two conditions are combined with a doubling of the participation rate by potentially HAMP-eligible borrowers, Option 1 and Option 3 no longer offer budgetary savings relative to current policy. Only Option 2, augmenting standard HAMP with principal forgiveness down to 100 percent, maintains its cost advantage over standard HAMP under all three scenarios.

Finally, the savings generated by principal forgiveness found in CBO's estimates are broadly consistent with FHFA's analysis of expected losses and benefits to the government for a portfolio of underwater borrowers with GSE-backed loans receiving a standard HAMP or HAMP PRA modification, which shows that small savings would result from HAMP PRA.²⁹ Most of the difference between FHFA's and CBO's estimates can be reconciled to differences in assumptions about populations of borrowers and modeling methodologies (see Appendix D for a detailed comparison of FHFA's and CBO's analyses).

Effects on the Macroeconomy

The options could spur economic activity by boosting the amounts that households spend because of increases in their monthly disposable income, net wealth, and creditworthiness (facilitating borrowing for their purchases of automobiles and other durable goods).³⁰ In CBO's view, the effects of the options on consumer spending would depend primarily on the resulting increase in households' resources and on the number of foreclosures averted, but those effects would be small. Specifically, even if a much higher fraction of the principal forgiven was spent in the near term than is typical following an increase in wealth and if the indirect effects on the economy were equal to CBO's high estimates of those effects (generating an additional \$1.50 of other spending per dollar of direct increase in consumer spending), the total effect from the options with the largest amount of principal forgiven would be an increase in gross domestic product of less than one-tenth of 1 percent in the near term, CBO estimates.

²⁹ Federal Housing Finance Agency, *Review of Options Available for Underwater Borrowers and Principal Forgiveness* (July 2012), www.fhfa.gov/Default.aspx?Page=403.

³⁰ Another potential effect of the options is a reduction in "house lock," a circumstance in which borrowers who owe more than the value of their home are constrained in their ability to move to take advantage of employment outside of their local area. Research has found mixed evidence on the effects of such situations on migration or labor mobility. One study focusing on permanent moves finds negative equity reduces household mobility by 30 percent; see Fernando Ferreira, Joseph Gyourko, and Joseph Tracy, *Housing Busts and Household Mobility: An Update*, Economic Policy Review (Federal Reserve Bank of New York, November 2012). In contrast, another study that included permanent and temporary moves by homeowners found that homeowners who had negative equity were slightly more likely to move than homeowners who had positive equity; see Sam Schulhofer-Wohl, "Negative equity Does Not Reduce Homeowners' Mobility," *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 35, no. 1 (February 2012), pp. 2-14, www.minneapolisfed.org/research/pub_display.cfm?id=4820.

With respect to the housing market, the overall impact of any of the options would also be small on a national scale, although some local areas might see a larger effect; the number of foreclosures averted by the policy would probably have a minor impact on the path of future home prices overall, given the total size of the housing market. In addition, the options would not create significant additional demand for homes, because all participants would already own at least one property.

This paper focuses on policies targeted toward borrowers who have missed payments and are underwater on their mortgage; policies with broader eligibility could have larger effects. For example, in November 2011, CBO analyzed a policy subsidizing the interest rate on certain mortgages refinanced by borrowers currently making their payments—specifically, providing a subsidy of 0.25 percentage points to the interest rate for the refinancing of loans during 2012 under the terms of the Home Affordable Refinancing Program.³¹ CBO estimated that adding that interest rate subsidy to HARP would have raised economic output over two years by \$0.20 to \$1.10 per dollar of total budgetary cost. Because the number of borrowers eligible under that policy of subsidizing interest rates would be much greater than those eligible under the options in this paper, both the budgetary cost and the effects on the macroeconomy would be substantially larger.

³¹ See the testimony of Douglas W. Elmendorf, Director, Congressional Budget Office, before the Senate Committee on the Budget, *Policies for Increasing Economic Growth and Employment in 2012 and 2013* (November 15, 2011), pp. 29-31, www.cbo.gov/publication/42717.

Appendix A:

Issues in Designing Principal Forgiveness Options

In implementing principal forgiveness at Fannie Mae and Freddie Mac—two government-sponsored enterprises (GSEs)—the Federal Housing Finance Agency (FHFA) and other policymakers would need to make a number of decisions on key design elements of the program. Those decisions—which would affect the expected number of borrowers who participate and the budgetary cost of the program—include: the amount of principal forgiveness, approaches to reduce moral hazard, eligibility requirements, the handling of default after modification, the role of private mortgage insurers and second mortgages, expenditures on operational costs, and timing.

Amount of Principal Forgiveness

The key design consideration is how much principal to forgive. To be cost-effective, each dollar of principal forgiven must be recouped through savings from averted defaults. An amount of principal forgiveness that is too small may not generate as large an improvement in default rates as a larger amount of forgiveness. However, increasing the amount of principal forgiveness will most likely attract more borrowers to the program, some of whom may not be at risk of foreclosure. The three principal forgiveness options that the Congressional Budget Office (CBO) considered in this analysis differ primarily in how much forgiveness borrowers are offered.

Approaches to Reduce Moral Hazard

Principal forgiveness programs have been cited as particularly vulnerable to “moral hazard”—a tendency for people to be more willing to take risks for which the potential costs or burdens will be borne in whole or in part by others—because borrowers’ incentive to become delinquent to obtain a lower mortgage balance may be stronger than for other types of modifications.³²

The Home Affordable Modification Program (HAMP), the main modification program used by the GSEs, and the HAMP Principal Reduction Alternative (HAMP PRA) already include a number of mitigants to moral hazard. Participating in HAMP has an adverse impact on a borrower’s credit score, which helps to discourage borrowers with good credit and no distress from participating. The ultimate impact on credit depends on a number of factors, including the delinquency status of the borrower before modification. For example, nondelinquent borrowers who have also maintained their payments on other financial obligations may suffer the most significant reduction in their credit score by accepting a modification, while severely delinquent borrowers (and those with a history of nonpayment on other loans) will have already seen their credit scores decline below a level acceptable to most lenders. In addition, borrowers

³² Federal Housing Finance Agency, *Review of Options Available for Underwater Borrowers and Principal Forgiveness* (July 2012), www.fhfa.gov/Default.aspx?Page=403.

who receive a principal reduction may experience a tax burden associated with the amount of principal forgiven, as that forgiveness may count as income in the period in which it is received.³³

HAMP also imposes checks on borrowers' income and ability to pay, which tend to reduce moral hazard because lowering income partially offsets potential benefits from a mortgage modification (although borrowers may also misrepresent income to become eligible). Finally, for a borrower to receive a HAMP offer, the modification must increase the expected value of the loan to the GSEs relative to the value if the loan remains unmodified, referred to as the net-present-value test. For its analysis, CBO assumes that all of those conditions would continue to apply to the principal forgiveness alternatives. In addition, CBO assumes that eligibility would be restricted to borrowers who are underwater on their mortgage (not counting any second mortgages or home equity lines of credit).

Several approaches have been proposed by policymakers, academics, and industry participants to address those moral hazard concerns in other ways.³⁴ The most straightforward approach would be to offer principal forgiveness only to borrowers who were delinquent at the time the program was announced. That rule would have the disadvantage of excluding borrowers who became delinquent after the cutoff date but for whom principal forgiveness would be the lowest cost solution for the GSEs.

Alternatively, policymakers could make the option less attractive to borrowers in ways that would not affect their ability or willingness to make payments on a modified loan. One such cost already exists in the form of a negative impact on the borrower's credit score. An additional cost could be to allow the investor in the modified loan greater access to the borrower's other assets or income in the event of a future default (also known as a "recourse" loan). Another approach would be to forgive a portion of the loan in exchange for granting the lender a claim on future equity or home appreciation—known as a "shared appreciation" modification. (See Appendix B for an overview of such modifications.) CBO does not incorporate a cutoff date, changes to the borrower's recourse obligation, or shared appreciation as additional mitigants in this analysis.

Eligibility Requirements

Policymakers and FHFA would need to make several decisions about which borrowers would be eligible for principal forgiveness. In all cases, broader eligibility would expand participation and increase the number of borrowers who might benefit from a modified loan. However, the type of borrowers who are made eligible will have an impact on delinquency rates and costs to the government. Allowing participation by borrowers who are too distressed to sustain the modified payment for an extended period may do little to reduce defaults and may ultimately increase the program's costs. Conversely, allowing relatively less distressed borrowers to participate may increase costs to the government if those borrowers would have continued to pay their mortgage even with a less generous modification program.

³³ Generally, forgiven debt is considered income for tax purposes. The Mortgage Debt Relief Act of 2007 allows taxpayers to avoid taxation of certain income created from forgiveness of mortgage debt on their principal residence; that provision was extended until January 1, 2014, in the American Taxpayer Relief Act of 2012 (enacted on January 1, 2013).

³⁴ Laurie Goodman and others, *Modification Effectiveness: The Private Label Experience and Their Public Policy Implications* (report submitted by Amherst Securities Group to the Pew Charitable Trusts Conference on Strategies for Revitalizing the Housing Market, May 30, 2012).

Some of the key eligibility criteria to be addressed include the following:

- In addition to delinquent borrowers, would borrowers who are current on payments but deemed to be at risk of imminent default be eligible?
- Would the number of months of delinquent payments among eligible borrowers be capped?
- Would borrowers who own vacation homes or investment properties be eligible?
- Would eligibility be based on borrowers' current credit score?

In all cases, CBO selected eligibility criteria consistent with the standard HAMP (Tier 1) program for each of the policy options.³⁵ Specifically, borrowers would be eligible if they are delinquent on mortgage payments or provide evidence of financial distress, with no cap on the number of months of delinquency required to qualify. Only owner-occupants would be eligible, and no credit score restrictions would be imposed.

Handling of Default After Modification

Borrowers could be required to “earn” their forgiven principal through continued timely payment on their modified loan. Similar to the approach used by HAMP PRA, Options 2 and 3 assume that principal would be forgiven in annual increments over a three-year period. If a borrower defaulted before the end of the “early termination window,” he or she would be required to repay the unearned portion of the forgiven principal. Although such conditions may reduce the expected cost of the program by making the reinstated principal eligible for repayment through some form of recovery (such as the proceeds from a foreclosure sale or through recourse), they may also reduce borrowers' willingness to continue to make payments on the modified loan as they may still remain deeply underwater during the first few years of the modification.

The Role of Private Mortgage Insurers and Second Mortgages

If principal is forgiven on the primary, or first, mortgage on a home, then the likelihood of default on that mortgage is reduced—thereby lowering expected payments by private mortgage insurers that make payments to lenders in the event of default. (Generally, mortgage insurance policies pay the lender a claim based on a “coverage percentage” applied to the unpaid principal balance. The coverage percentage is based on the original loan-to-value ratio and the term of the loan.) The GSEs can renegotiate the private mortgage insurance contract as a part of the modification. Alternatives include requesting a partial payment from the insurer to defer the cost of the principal write-down (also known as a “preclaim” advance) or resetting the principal balance to the premodification amount to calculate a future private mortgage insurance claim should the modified loan ultimately default.

Similarly, if principal is forgiven on the first mortgage on a home, then the likelihood of default on a second mortgage is also reduced—benefiting the investor in the second mortgage. According to standard

³⁵ Effective June 1, 2012, HAMP was expanded beyond the original HAMP eligibility criteria (Tier 1) to include a broader set of borrowers (Tier 2). That expansion made HAMP available to investor loans and provided greater flexibility with respect to target postmodification debt-to-income ratios, among other changes. The eligibility criteria considered by CBO for this analysis are for those loans in Tier 1.

practice, however, the first mortgage has highest priority for repayment and a second mortgage would generally absorb losses up to the entire value lent before the first mortgage absorbed a loss such as from principal forgiveness. Therefore, the GSEs, as investors in first mortgages, could request concessions from investors in second mortgages on properties of borrowers who are eligible for a modification to their first mortgage. For example, the GSEs could request principal forgiveness in a second mortgage proportional to that in the first mortgage. Alternatively, the GSEs could make all loans with a second mortgage ineligible for a principal forgiveness modification on the first. While that policy could limit the scope of the program, it would reduce operational issues and concerns about mortgage priority.

For all options, CBO assumed that current private mortgage insurance coverage would stay in effect without change. In the case of principal forgiveness, the claim would be paid on the basis of the postmodification loan amount, which would generally reduce the size of claim payments by insurers in the event of a subsequent default. In cases in which no mortgage insurance exists on the loan prior to modification, CBO assumed that situation would continue after the modification. CBO's analysis does not reflect any additional compensation from private mortgage insurers or second-lien holders who would benefit from the smaller losses that would result from a modification.

Expenditures on Operational Costs

Each of the principal forgiveness approaches CBO examined may create additional operational, technical, or legal issues for the GSEs relative to current policy, raising indirect costs of the modification. Such indirect costs could also complicate the strategy for piloting or testing principal forgiveness on a smaller scale as investments to resolve legal, technical, or operational barriers must be made before launching a modification program. Because of those concerns, the GSEs and others have attempted to thoroughly evaluate the costs, benefits, and potential scope of a principal forgiveness modification program. FHFA estimated that a principal forgiveness modification option could cost the GSEs approximately \$70 million to \$90 million and take more than a year to implement.³⁶

CBO incorporated \$80 million, or the midpoint of that estimate, as the cost to the GSEs of implementing principal forgiveness in the options it analyzed.

Timing

Not all eligible borrowers who choose to participate in a modification program will receive that modification immediately. First, it will take the GSEs and mortgage servicers some time to implement principal forgiveness. Second, some borrowers choose to apply for a modification as soon as they experience delinquency or distress, whereas others wait some time. Finally, once they decide to apply, borrowers must complete a modification application and satisfy any requirements necessary to receive a permanent modification, including completion of any trial modification that is part of the program.

Although HAMP is set to expire on December 31, 2013, CBO's analysis is based on modifications that would be performed over a period of two years after the GSEs have implemented a principal forgiveness modification program. In addition, the analysis is based only on permanent modifications, considering

³⁶ Federal Housing Finance Agency, *Review of Options Available for Underwater Borrowers and Principal Forgiveness* (July 2012).

borrowers who failed to successfully complete a trial modification as nonparticipants. Thus, “current policy” in this analysis reflects the assumption that HAMP would be extended for at least one additional year.

Appendix B

Shared Appreciation Modifications

One potential strategy for mitigating moral hazard associated with principal forgiveness modifications that has received considerable attention is the use of shared appreciation.³⁷ A shared appreciation modification (SAM) allows the investor in a mortgage to share in future appreciation of the value of the underlying home in exchange for forgiving a portion of the loan balance. At least one major servicer has implemented SAMs, combining principal reduction with a program that gives 25 percent of the home's appreciation in value to the investor.³⁸ For example, a borrower who owes \$120,000 on a home with a current value of \$100,000 may have the loan written down to \$95,000 in exchange for granting the investor the right to receive 25 percent of any future increase in the value of the home (see Figure B-1).

When the home is sold, the proceeds of the sale go first to paying off the remaining balance on the modified loan. The remaining proceeds are split between the homeowner and the investor, with the exact nature of the split determined by the SAM contract (see Table B-1 for an overview of design considerations in a SAM). Assuming that split is based solely on the appreciation in a home's value from modification to sale (\$50,000 in this example), the investor will receive \$12,500 and the homeowner will receive the remaining proceeds of \$57,500. The homeowner's share of proceeds in this example comes from three different sources of equity:

- \$5,000 initial equity created at the time of modification;
- \$37,500 from the 75 percent share of the home's appreciation in value; and
- \$15,000 from the pay-down of the modified mortgage from \$95,000 to \$80,000.

The shared appreciation arrangement is designed to address concerns about moral hazard by raising the cost of the modification to borrowers and to reduce the net cost to investors by granting them some future claim on home appreciation to offset the loss they experienced from the principal reduction. With respect to moral hazard, the prospect of sharing future home appreciation with a third party may be sufficient to dissuade some nondistressed homeowners from seeking a principal forgiveness option using shared appreciation. The strength of that deterrent depends on a number of factors, including the borrower's

³⁷ For references to the use of shared appreciation in modifications, see Andrew Caplin and others, *Facilitating Shared Appreciation Mortgages to Prevent Housing Crashes and Affordability Crises*, Discussion Paper 2008-12 (Brookings Institution, The Hamilton Project, September 2008), www.brookings.edu/research/papers/2008/09/mortgages-caplin; John Griffith and Jordan Eizenga, *Sharing the Pain and Gain in the Housing Market* (Center for American Progress, March 2012), www.americanprogress.org/issues/housing/report/2012/03/29/11251/sharing-the-pain-and-gain-in-the-housing-market; and Sanjiv R. Das, "The Principal Principle," *Journal of Financial and Quantitative Analysis* (forthcoming), <http://dx.doi.org/10.1017/S0022109012000506>.

³⁸ Jon Prior, "Ocwen Reduces Principal on Old Saxon Mortgages," *HousingWire* (September 7, 2012), www.housingwire.com/news/ocwen-slashes-principal-old-saxon-mortgages.

expectations for future home appreciation. If borrowers expect rapid appreciation, the prospect of sharing that growth with an investor may far outweigh the prospect of receiving a reduction in their loan balance today. However, if borrowers expect home prices to grow slowly (or to continue to decline), the future cost of sharing that appreciation may be somewhat low, reducing the effectiveness of SAMs in mitigating moral hazard.

From the investor's perspective, the value of a shared appreciation modification depends on the expectation of borrowers' behavior and the future path of home prices. For investors to collect on their share of appreciation granted under the SAM, two things must happen. First, the home must appreciate in value enough to generate a claim. Second, some event must take place that triggers the termination of the SAM contract, such as the sale of the home. The combination of those two factors will affect not only the amount that the investor collects at some point in the future but also the value the investor places on the contract at the time of the modification.³⁹ For example, if the homeowner sells the home shortly after the SAM is put in place, the amount of appreciation (and the investor's share) is likely to be limited. However, the investor will receive that share quickly, which increases the present value of the expected future cash flows to the investor. But if the homeowner remains in the home for several years, the probability of future home price increases may be higher.⁴⁰ The present value of those increases may be lower, however, given that they will not be collected for many years (see Table B-2 for a stylized example of SAM investor cash flows).

Investors must also address a number of issues in implementing a shared appreciation modification program, including the following:

- Legal contracts to clearly define the rights and responsibilities of the investor and the homeowner;
- Educational materials to enhance consumers' understanding of their contractual obligations; and
- Technological and operational changes to acquire, track, report, and terminate SAM interests.

³⁹ The presence of a SAM would reduce net losses for the investor from offering a principal forgiveness modification. The extent of that reduction would depend on the value placed on the SAM claim at the time of initiation.

⁴⁰ In most models that project home prices, those prices depend on the expected future value as well as the volatility of those values. Both factors will play a role in how an investor values a SAM at the time the contract is initiated.

Appendix C

Modeling Approach and Assumptions

All results in this paper were derived using the Congressional Budget Office's (CBO's) macroeconomic forecast and models of mortgage defaults and prepayments. Estimates of costs were developed from those models using standard financial techniques. This appendix briefly describes those models and techniques as well as adjustments made to reflect the unique nature of the specific policy options analyzed in this paper.

Modeling Mortgage Performance

CBO estimated statistical models of prepayment, default, and loss-given-default using data provided by the Federal Housing Finance Agency (FHFA) and the Federal Housing Administration (FHA). The prepayment and default models were developed using a sample of approximately 2.2 million single-family mortgages guaranteed by the government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, over the 1989–2011 period. The models use the set of static and dynamic explanatory variables contained in Table C-1 to predict the conditional probability that a mortgage will prepay or default during a particular quarter.⁴¹

As measured by the model, default is defined as a borrower missing three consecutive mortgage payments and thus becoming 90-days delinquent on the loan. Because not all borrowers who miss three payments ultimately result in a guarantee claim against the GSEs, default rates generated by CBO's model are reduced before a loss is calculated. CBO used the following transition rates from delinquent status to default:

- Borrowers who were current at the time of the modification decision have a 50 percent transition rate from a subsequent 90-day delinquency to default;
- Borrowers who were 30 to 59 days delinquent at the time of the modification decision have a 60 percent transition rate from a subsequent 90-day delinquency to default;
- Borrowers who were 60 to 89 days delinquent at the time of the modification decision have a 70 percent transition rate from a subsequent 90-day delinquency to default;
- Borrowers who were 90 to 119 days delinquent at the time of the modification decision have a 80 percent transition rate from a subsequent 90-day delinquency to default;
- Borrowers who were 120 to 179 days delinquent at the time of the modification decision have a 90 percent transition rate from a subsequent 90-day delinquency to default; and

⁴¹ Static variables are based on a single observation captured either at the time of a loan's origination or modification. Dynamic variable values change over the life of the mortgage and are updated each period to reflect the latest values.

- Borrowers who were 180 or more days delinquent at the time of the modification decision have a 100 percent transition rate from a subsequent 90-day delinquency to default.

Those transition rates are higher than standard transition rates for borrowers moving from delinquency to default.⁴² However, a higher transition rate is consistent with the assumption that borrowers with previous delinquency (which, in this case, was resolved through a modification) are more likely to default than those who have not missed a prior mortgage payment.

CBO made an additional adjustment to the default model to reflect the potential that borrowers with a modified loan may be more sensitive to debt-to-income (DTI) ratios than the population as a whole. That adjustment, which was used to calibrate the parameters of the default model, involved doubling the coefficient of the DTI parameter in the default equation. That change was designed to yield 1-year default rates for the Home Affordable Modification Program (HAMP) policy option in line with redefault rates published by the Department of the Treasury and the Office of the Comptroller of the Currency for loans modified under the program. In tandem, CBO also adjusted the constant of the equation such that the projected default rates in the case of no modification were equal to those generated by the model without the adjustment to the DTI coefficient.

The loss-given-default model was developed using a sample of FHA mortgages terminated by a claim between 1990 and 2011, consisting of more than 800,000 claims. The model predicts the severity of the loss the GSEs will experience once a default occurs, using the set of static and dynamic parameters provided in Table C-2.

FHA data were used for the model because robust data on FHA claims was more readily available to CBO than claims information on the GSEs themselves. FHA severity is often higher than GSE severity as a result of the presence of private mortgage insurance on some GSE loans. In those cases, the GSEs' losses are reduced by claim payments from the mortgage insurers. FHA loans do not have private mortgage insurance policies, leaving FHA to bear the full amount of the loss in the event of a default. Although the impact of mortgage insurance depends on a number of factors—including the age of the loan, the original loan-to-value (LTV) ratio, and the coverage level of the policy—CBO made the simplifying assumption that GSE severity rates would be 30 percent lower than the rates generated by the loss-given-default model based on FHA claims. That assumption reflects a relatively high percentage of loans having an amount of mortgage insurance coverage consistent with a high LTV ratio at origination.

In addition, CBO calibrated the current loan-to-value parameter of the loss-given-default model to produce a loss equal to approximately 20 percent of the current value of the home. That 20 percent loss reflects a weighted average outcome across all potential dispositions (including foreclosure, short sale, or other future loss-mitigation action) and includes expected settlement charges, disposition costs, and the value of mortgage insurance coverage, if any.

⁴² For example, see Federal Reserve Bank of New York, *Quarterly Report on Household Debt and Credit* (August 2012) for transition rates from delinquencies of 30 to 60 days to delinquencies of 90 days or more.

Cash Flows and the Calculation of Subsidy Cost

CBO used the outputs of the prepayment, default, and loss-given-default models to generate quarterly cash flows for each group of borrowers. Those cash flows provided the foundation for calculating the expected subsidy cost to the government for a loan under current policy and under each option.

The subsidy cost to the GSEs of a loan held by investors is equal to the cost of the guarantee provided by the GSEs minus the present value of fees collected by the enterprises and the cost of any concessions provided on those loans. For the analysis, CBO assumed that the GSEs would collect a 0.25 percent annual guarantee fee on all loans and would not collect any upfront fees as a part of the modification process. Because fees collected (other than upfront fees) expose investors to the same risk as unguaranteed cash flows, those quarterly fee cash flows are discounted at the same rate as the cash flows associated with the loan without a guarantee.

In addition to the subsidy cost incurred by the GSEs in restructuring loans held by investors, CBO estimated the cost associated with incremental modifications created by a change in modification policy on the mortgage-backed securities (MBSs) held directly by the GSEs, the Treasury, and the Federal Reserve. For that cost, CBO estimated that the modified loans were in securities with a current market value that is 2 percentage points above par or principal value and that one-half of all incremental modifications were made to loans contained in MBSs held in the portfolios of federal investors. For example, Option 3 generated 57,000 incremental modifications, or \$11 billion of MBS balances, in CBO's central estimate. On the basis of a loss of 2 percentage points and a federal share of 50 percent, those incremental modifications created a budgetary cost of \$0.10 billion. Losses on MBSs held in the portfolios of federal investors are smaller under Option 1 (\$0.06 billion) and Option 2 (\$0.05 billion), respectively. Those amounts, along with the \$80 million in operational costs to implement principal forgiveness, were added to the subsidy cost to calculate the net increase or decrease in the budget deficit under each option.

CBO calculated the fair-value subsidy cost to the GSEs of a guarantee on a loan held by investors as the difference between the present value of the loan with a guarantee reimbursing the investor for credit losses and the present value of that same loan without a guarantee.⁴³ The investor in the loan with a full credit guarantee receives scheduled payments of principal and interest, prepaid principal, and defaulted principal in each period. The investor in the loan without the guarantee receives payments of scheduled principal and interest, prepaid principal, and any recoveries received from defaulted principal in each period.

Finally, the subsidy cost also captures the effect of concessions made to the borrower as a part of the modification. For interest rate reductions offered under HAMP and under the HAMP Principal Reduction Alternative (PRA), CBO based the cost on the difference between the modified note rate during the first five years and 5 percent, a proxy for an unsubsidized interest rate for a modified borrower. At the end of five years, when the borrower's note rate is reset to the current market rate, the cost of the interest rate reduction was set to zero. For principal forgiveness to 100 percent and 90 percent LTV ratios, when

⁴³ That approach is consistent with financial methods included in standard texts such as Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, 5th ed. (McGraw-Hill, 1996), pp. 669-670.

borrowers are given a 5 percent note rate as a part of the modification, the interest rate concession was set to zero. For all principal forgiveness modifications, the cost of forgiven principal was included in the subsidy cost calculation. Loans that were not modified were assumed to remain in the pools backing the MBSs issued by the GSEs. Thus, for unmodified loans, the subsidy cost includes credit losses net of the guarantee fees received by the GSEs, but the 6 percent rate paid by the borrower minus the guarantee and other fees is assumed to accrue to MBS investors.

The discount rate used to calculate the present value of all quarterly cash flows is an estimate of the rate of return that mortgage investors require to invest in mortgages with or without a credit guarantee. For the guaranteed loan, the only uncertainty the investor has is the level of prepayments that may occur as the loan matures. Thus, guaranteed loan cash flows are discounted at a risk-free rate plus a premium to compensate investors for the risk of prepayments. In this analysis, the risk-free rate was set at 2 percent per year and the additional risk premium for bearing prepayment risk was set at 0.50 percent per year. For the loan without a guarantee, the investor is exposed to prepayment risk and market risk associated with the number of defaults and recoveries that may occur because of worse-than-expected macroeconomic conditions. Given that additional market risk, cash flows from the unguaranteed loan are discounted at a combination of the risk-free rate (2 percent per year), the prepayment risk premium (0.50 percent per year), and an additional market risk premium. For this analysis, the market risk premium was set on the basis of the expected number of lifetime cumulative defaults projected for the individual group of borrowers (with a cap at 50 percent lifetime cumulative defaults) and ranged from 0.40 percent per year (in line with CBO's estimate for the entire portfolio of GSE guarantees) to more than 2.40 percent per year (see Figure C-1).

Adjustments for Policy Options

For each policy option, a distinct set of loan cash flows was generated for each group of loans. Those cash flows depend on the terms of the modification, which changes either the amortization schedule or borrowers' behavior—specifically, their propensity to prepay or default.

CBO's model was adapted for each group by adjusting the values of the key parameters pertaining to each modification program. The model includes variables related to the borrower's interest rate (expressed as a spread above current market rates), the original and current LTV ratios of the mortgage, and the borrower's DTI ratio. Policy options can affect some or all of those variables. For example, a HAMP modification lowers the interest rate spread, lowers the DTI ratio, leaves the postmodification LTV ratio unchanged, and may slightly reduce or increase future LTV ratios depending on what happens to the term of the mortgage. (See Table C-3 for an overview of key loan-level features changed for each policy option before the calculation of subsidy cost.)

CBO made a number of other assumptions that affected the cash flows:

- All loans were assumed to have an unpaid principal balance at the time of the modification of \$200,000.
- Borrowers' interest rates were assumed to be 6 percent prior to modification. Postmodification rates were set to 5 percent for principal forgiveness loans. For HAMP and HAMP PRA loans, mortgage rates were set according to the HAMP waterfall process and were reset to the current

market rate after five years. The impact of that interest rate reduction is included in CBO's subsidy cost calculation.

- For HAMP and HAMP PRA loans for which forbearance was required to reach the target postmodification monthly payment, that forbearance was valued at 25 percent of the total amount, reflecting both a probability that some forbore principal would not be collected because of borrower default and that any amount collected would occur in the future and need to be discounted to a present value.
- For HAMP PRA, incentive payments made by the Treasury to reimburse the GSEs for principal forgiven are not included given that they have no net impact on the deficit.
- In all principal forgiveness options, CBO assumed that the forgiveness would be earned over a three-year period of on-time payment. If the borrower defaults prior to the completion of that three-year period, the amount of principal forgiven would be added back into the current loan amount to determine the borrower's total mortgage indebtedness.
- All modified loans were assumed to perform like newly originated loans (with the interest rate, monthly payment, and LTV ratio created by the modification) for the purposes of calculating prepayment and default probabilities postmodification. Although that assumption ignores the impact of mortgage age on those probabilities, it does recognize that borrower performance would probably change from the original loan as a result of the concessions granted by the modification.⁴⁴ To keep cash flow calculations consistent with modified loans, unmodified loans were also assumed to have no payment history. (Alternative scenarios, assuming some payment history for the loans before the modification decision, did change the total subsidy costs for each policy option but did not materially change the relative cost differences across those scenarios.)

Borrowers' Eligibility, Participation, and Loan Characteristics

For its analysis, CBO estimates that under current policy approximately 20 percent of underwater borrowers would meet the standard HAMP eligibility criteria, amounting to approximately 610,000 loans with an unpaid principal balance of \$122 billion. The 20 percent estimate and \$200,000 average loan size are based on CBO's analysis of FHFA's review of the potential effects of implementing principal forgiveness at the GSEs.⁴⁵ In that review, 497,000 loans with a balance of \$99.3 billion had an LTV ratio exceeding 115 percent and met other HAMP eligibility criteria as of June 30, 2011. That amount represents approximately 20 percent of the total population of \$488.7 billion of loans with LTV ratios above 115 percent at that same date.

CBO uses the population of GSE-backed loans with negative equity (\$608 billion, and approximately 3.0 million borrowers as of December 31, 2012) as a starting point for its estimate of the population of

⁴⁴ Mortgage age, or the number of periods since loan origination, is a factor in many mortgage prepayment and default models. Generally, prepayment and default rates increase in the initial years after origination before leveling out or decreasing as the loan ages.

⁴⁵ Federal Housing Finance Agency, *Appendix to FHFA Review of Options*, www.fhfa.gov/Default.aspx?Page=403.

potentially HAMP-eligible borrowers. From that portfolio, borrowers expected to be eligible for HAMP (\$122 billion) or to refinance and those that fail other HAMP eligibility criteria (including owner-occupancy, a current DTI ratio greater than 31 percent, and a positive net-present-value, or NPV, test result) must be removed. As a final step, CBO used loan-level data provided by FHFA to approximate the size and distribution by key borrower and loan characteristics of remaining loans. That analysis resulted in an estimate that an additional 18 percent of the population of underwater borrowers (\$110 billion, and 550,000 loans) could become eligible for a principal forgiveness modification with the same eligibility criteria as standard HAMP by becoming delinquent.

CBO estimated rates of participation by borrowers on the basis of the size of the concession they would receive, with either a larger reduction in DTI ratio or loan balance expected to produce a higher participation rate. FHFA's review of the potential effect of implementing principal forgiveness at the GSEs is in line with CBO's estimate that nearly 40 percent of eligible loans, or 227,000 borrowers and \$45 billion in unpaid principal, will be modified. According to that information, approximately 25 percent to 30 percent of delinquent borrowers with high LTV and DTI ratios will receive a permanent modification within one year. However, FHFA and the GSEs expect that rate to rise as high as 50 percent as a result of servicer process improvements. The borrowers who do not receive a permanent modification include those who do not apply for a modification, those who do not receive a positive NPV test, and those who do not successfully complete their trial modification. In this analysis, CBO did not attempt to quantify the impact of those different factors on reducing overall participation.

Although that amount of participation over two years represents an increase over the estimated 192,000 HAMP modifications the GSEs would perform on the basis of completed permanent modifications through the first eight months of 2012 (at approximately 8,000 per month), it is consistent with FHFA's expectation that participation rates are expected to increase as servicers improve their borrower outreach and processing capabilities as HAMP matures.⁴⁶

For potentially HAMP-eligible borrowers, CBO employed additional steps beyond those already used with the HAMP-eligible population for each modification. First, participation in standard HAMP was set to zero to recognize that borrowers in that population have opted not to pursue a modification that does not offer principal forgiveness in spite of the level of participation expected on the basis of the concessions offered by HAMP. Second, participation in each principal forgiveness modification was set equal to the difference between expected participation in the principal forgiveness modification and expected participation in standard HAMP based on the concessions offered by each program (with a floor of zero percent). That adjustment is designed to set participation in principal forgiveness as an increment to HAMP participation resulting from the introduction of concessions that reduce loan balances rather than monthly payments alone.

For example, borrowers with a premodification LTV ratio of 180 percent and DTI ratio of 60 percent would be expected to have a participation rate of 47 percent in HAMP and 72 percent in principal

⁴⁶ Federal Housing Finance Agency, *Foreclosure Prevention Report* (August 2012), www.fhfa.gov/Default.aspx?Page=172.

forgiveness to 100 percent LTV, implying 25 percent of borrowers with those characteristics who are in the potentially HAMP-eligible population would participate in principal forgiveness to 100 percent LTV.

The distribution of borrowers' characteristics is as important as the total number of participants. The distribution for the HAMP-eligible population would match the distribution of borrowers with GSE-backed loans who have received a positive result from the HAMP NPV model under HAMP to date, CBO projects.⁴⁷ Although the NPV test used for standard HAMP would need to be modified to accommodate a principal forgiveness modification program, CBO's analysis suggests that those revised tests would not result in a significantly different profile of loans receiving a positive result.

In total, HAMP-eligible borrowers were classified into 432 distinct groups, representing the combination of six current LTV ratios (100 percent, 120 percent, 140 percent, 160 percent, 180 percent, and 200 percent), four credit scores (600, 660, 700, and 740), six delinquency categories (current, 30 days, 60 days, 90 days, 120 days, and 180 days), and three DTI ratios (40 percent, 60 percent, and 80 percent) (see Table C-4).

The composition of the borrowers expected to seek a principal forgiveness modification from outside the expected HAMP-eligible population under current policy is based on two factors. First, some portion of the borrowers are expected to share characteristics (including current LTV ratio, credit score, and DTI ratio) with the population of borrowers already eligible for HAMP, with the sole distinction being that they were not expected to become delinquent prior to the introduction of the principal forgiveness modification program. That overlap would come largely from the less-distressed segments of the HAMP-eligible population, as the more-distressed borrowers would most likely already have taken advantage of standard HAMP. Second, a different portion of the population would come from borrowers with higher credit scores and lower DTIs than the HAMP-eligible segment.

The population of potentially HAMP-eligible borrowers was further classified into 80 distinct groups, representing the combination of four current LTV ratios (100 percent, 120 percent, 150 percent, and 180 percent), five credit scores (600, 660, 700, 750, and 780), and four DTI ratios (34 percent, 38 percent, 45 percent, and 60 percent). Although those borrowers must become delinquent to qualify for a modification, all borrowers were considered to be nondelinquent for evaluation in CBO's statistical model (see Table C-5).

⁴⁷ HAMP records were compiled by the Department of the Treasury, *Making Home Affordable Data Files*, www.treasury.gov/initiatives/financial-stability/results/Pages/mha_publicfile.aspx. CBO's tabulations exclude non-GSE loans, adjustable-rate loans, loans with a current LTV ratio of less than 100 percent or greater than 300 percent, and loans with a mortgage debt-to-income ratio greater than 100 percent.

Appendix D

Policy Options Under Alternative Assumptions

The Congressional Budget Office (CBO) examined the sensitivity of subsidy costs to alternative assumptions about various factors, including the following:

- Delinquency and participation rates,
- Changes in monthly payments,
- Changes in loan-to-value (LTV) ratios, and
- Alternative market risk premiums.

Sensitivity to Delinquency and Participation Rates

Borrowers who are potentially eligible for the Home Affordable Modification Program (HAMP), or borrowers who meet all HAMP eligibility criteria except for the fact that they not delinquent or deemed at risk of default today, may be less likely to become delinquent in the absence of a program of principal forgiveness than CBO's models predict. CBO tested three different scenarios, in each case reducing conditional per-period default rates for potentially HAMP-eligible borrowers who do not receive a modification to 50 percent of CBO's central estimate. In the first scenario, only the reduction in default rates was done. In the second and third scenarios, the default rate reduction was combined with increased participation by those borrowers in principal forgiveness modifications under Options 1, 2, and 3. The second scenario set participation rates to a level consistent with borrowers, rather than Fannie Mae and Freddie Mac (the government-sponsored enterprises, or GSEs), having control of the selection of which modification offer they receive; that treatment served as a proxy for a situation in which the GSEs are less effective at assigning borrowers to the lowest-cost modification. In the third scenario, borrowers are again assumed to select the modification, and participation was set at twice the level implied by the standard equation.

In all cases, costs to the government under current policy and Options 1 to 3 declined as the costs associated with potentially HAMP-eligible borrowers who do not receive a modification dropped (see Table D-1). However, the cost under standard HAMP decreased more as all potentially HAMP-eligible borrowers remain unmodified and receive the lower conditional default rates, CBO estimates. When those default rate decreases are combined with additional participation in principal forgiveness in the second scenario, the budgetary savings associated with Option 1 disappear and with Option 3 decrease significantly. Under the third scenario, the savings found in CBO's central estimate no longer exist for either Options 1 or 3 and decrease to \$1.3 billion under Option 2.

Sensitivity to Changes in Monthly Payments

Alternatively, borrowers may be more or less sensitive to changes in their monthly payment. One method for assessing those concerns is to adjust the borrower's expected propensity to default after a change in the postmodification debt-to-income (DTI) ratio in the behavioral model, both decreasing it by 50 percent and increasing it by 100 percent and then recalculating the total subsidy cost.

When borrower sensitivity is cut in half, the subsidy cost of all modifications increases. That increase is a function of borrowers being less prone to avoid default as a result of the reduction in their DTI ratio created by a modification, though the cost of that modification remains the same. When borrower sensitivity to the postmodification DTI ratio is increased, all modifications generate lower subsidy costs, as fewer borrowers are projected to default because of the lower mortgage payment created by the modification. In both cases, the relative cost of Options 1 to 3 remains at or below that of standard HAMP alone. That advantage narrows slightly with lower sensitivity and increases slightly with higher sensitivity.

Sensitivity to Changes in Loan-To-Value Ratios

A similar exercise was performed to examine the change in subsidy costs when borrower sensitivity to LTV ratios is both halved and doubled. With borrowers less sensitive to LTV under all policy options, all modifications show a reduction in total subsidy costs for this population of high LTV loans. That improvement is a result of the expectation that a high LTV ratio will be less of a factor in a borrower's decision to default once his or her sensitivity to that variable is decreased in CBO's model. When sensitivity to LTV was doubled, total subsidy costs for current policy and all policy options increased. In both cases, the relative cost difference between standard HAMP and principal forgiveness narrowed, but not enough to make HAMP alone a less costly alternative to an option that augments HAMP with principal forgiveness.

Sensitivity to Alternative Market Risk Premiums

CBO calculated the cost of the policy alternatives on a fair-value basis, which can be interpreted as an estimate of the price that a competitive private investor would charge as a market risk premium to take on the taxpayers' obligations under each policy.⁴⁸ Setting higher market risk premiums for loans with higher expected default rates is consistent with research and industry practice.⁴⁹ That practice benefits policy options that produce lower default rates, like principal forgiveness to 90 percent LTV, relative to those, like HAMP, that result in higher postmodification default rates, because the effect of market risk premiums on subsidy costs is greater when those premiums are large and the value of future payments is heavily discounted. That benefit is relatively small for borrowers with low LTV ratios, for whom the relative difference between principal forgiveness and HAMP default rates are small. That benefit increases, however, when borrowers' LTV ratios increase and the relative difference in lifetime default rates between policy options widens.

If the degree to which the market risk premium increases as expected defaults increase is reduced, total subsidy costs drop for all policy options as the compensation private investors would demand is lower. In addition, the advantage of principal forgiveness to standard HAMP declines for Options 2 and 3 (while remaining nearly the same for Option 1), as higher default rates have a smaller impact on the risk premium. If investors' sensitivity to higher expected default rates is increased, that pattern reverses as

⁴⁸ Congressional Budget Office, *Fair-Value Accounting for Federal Credit Programs* (March 2012), www.cbo.gov/publication/43027.

⁴⁹ See John Hull, Mirela Predescu, and Alan White, "Bond Prices, Default Probabilities, and Risk Premiums," *Journal of Credit Risk*, vol. 1, no. 2 (Spring 2005), pp. 53–60, www-2.rotman.utoronto.ca/~hull/DownloadablePublications/CreditSpreads.pdf.

total subsidy costs for all scenarios increase and the relative advantage of the lower-default principal forgiveness options widens against standard HAMP.

Appendix E

Comparing CBO's and FHFA's Methodologies and Results

On July 31, 2012, the Federal Housing Finance Agency (FHFA) released an analysis of expected losses and benefits to the government for a portfolio of underwater borrowers with government-sponsored enterprise (GSE)-backed loans receiving a modification through standard HAMP (the Home Affordable Modification Program) and the HAMP Principal Reduction Alternative (PRA).⁵⁰ Although estimates from both FHFA and the Congressional Budget Office (CBO) show that loan modifications through HAMP PRA would be less costly than HAMP, CBO's estimates are quite different in magnitude because of differences in the agencies' modeling choices and policy assumptions. To illustrate the effect of those differences, CBO reconciled its analysis with FHFA's in a sequence of steps. (For a summary of the effect of each of those changes on the estimated cost of each policy option, see Table E-1.)

- Modification Policy:** Moving to a policy whereby the GSEs replace, rather than augment, standard HAMP with a principal forgiveness modification increases the number of modifications completed (because participation rates are generally higher for principal forgiveness relative to HAMP) and increases the total cost to the GSEs (because the GSEs are no longer able to offer HAMP to borrowers when it lowers the expected cost). However, because the cost difference between standard HAMP and a principal forgiveness alternative averages less than \$20,000 per loan, that policy change has only a small effect on the relative value of each policy option in CBO's analysis.
- Population Adjustment:** Adjusting CBO's population of borrowers receiving a modification to be more consistent with FHFA's—by removing potentially HAMP-eligible borrowers, removing loans with a loan-to-value (LTV) ratio of less than 115 percent, and increasing participation to 100 percent under all modification policy options—increases the subsidy cost as a percentage of the loan's balance for both no-modification and all-modification scenarios.⁵¹ Removing potentially-HAMP eligible borrowers and those with LTVs of less than 115 percent had the greatest impact in raising relative subsidy costs as those less-risky borrowers tend to have a lower per-loan subsidy cost than borrowers with higher LTVs or some evidence of financial distress.

⁵⁰ Federal Housing Finance Agency, *Review of Options Available for Underwater Borrowers and Principal Forgiveness* (July 2012), www.fhfa.gov/Default.aspx?Page=403.

⁵¹ FHFA, with access to nonpublic loan-level data from the GSEs, based its analysis on a population of current and delinquent loans as of June 2011 with marked-to-market LTV ratios above 115 percent, resulting in 497,000 HAMP-eligible loans with an unpaid balance of \$99.3 billion in Analysis 11. CBO, on the other hand, used publically available data from the GSEs as of the fourth quarter of 2012 and included borrowers with marked-to-market LTV ratios above 100 percent, yielding a population of 740,000 HAMP-eligible loans with an unpaid balance of \$148 billion and 670,000 potentially HAMP-eligible loans with an unpaid balance of \$134 billion. CBO's inclusion of borrowers with LTV ratios between 100 percent and 115 percent and borrowers who are not currently HAMP-eligible because of their delinquency status creates both a different sized portfolio for analysis and, undoubtedly, a different mix of borrowers based on important characteristics such as current LTV ratio, credit score, and debt-to-income ratio.

With those adjustments, standard HAMP still produces higher relative subsidy costs than no modification and each principal forgiveness option.

- **Default Loss Estimates:** On the basis of a review of the HAMP net-present-value (NPV) model that FHFA used in its analysis, CBO concludes that a number of elements of that model yield different results than the statistical models used in CBO's own analysis. In particular, FHFA's default equation appears to produce slightly lower default rates for borrowers who do not receive a modification and even lower results for borrowers who do receive a modification. In addition, the HAMP NPV severity model appears to produce higher losses given default than CBO's model.
- **Discount Rates:** The use of a single discount rate in the HAMP NPV model equal to the Freddie Mac Primary Mortgage Market Survey weekly rate for 30-year fixed-rate conforming loans, rather than a rate used by CBO that adds a risk premium to the Treasury rate that changes with the number of expected defaults, has two effects. First, it provides an advantage to standard HAMP compared with no modification. Both scenarios produce high default rates relative to principal forgiveness and, therefore, receive essentially the same high risk premium under CBO's approach. However, default rates under the no-modification scenario are much higher, and those defaults occur sooner than under standard HAMP. As a result, more cash flows are received in the earlier years, making the impact of a higher discount rate much smaller than under standard HAMP, in CBO's analysis. Removing that risk premium in the HAMP NPV model makes both scenarios look less expensive but provides a greater improvement to standard HAMP than no modification. Second, the use of a single discount rate provides a relative advantage to standard HAMP and HAMP PRA, which yield higher expected defaults and receive a higher risk premium under CBO's approach, than principal forgiveness under Options 2 and 3. Once again, removing that risk premium in the HAMP NPV model benefits both standard HAMP and all policy options but provides a larger benefit to HAMP and HAMP PRA.
- **Other Considerations:** Removing fee income from the subsidy cost calculation slightly increases the cost for each modification option but does not have a significant impact on the difference in cost across options.

Taken together, those adjustments bring CBO's estimates much closer to those reported by FHFA for the no-modification, HAMP, and HAMP PRA policies. Principal forgiveness to 100 percent of a home's value continues to show savings relative to HAMP after those adjustments. In contrast, principal forgiveness to 90 percent of a home's value produces a cost nearly equal to that of standard HAMP after those adjustments, removing the savings obtained in CBO's central estimate.

Table 1.
CBO's Central Estimates of the Impact of the GSEs' Current Policy and Three Options Involving Principal Forgiveness

	Current Policy: Standard HAMP	Option 1: Standard HAMP or HAMP Principal Reduction Alternative		Option 2: Standard HAMP or Principal Forgiveness to 100 Percent of a Home's Value		Option 3: Standard HAMP or Principal Forgiveness to 90 Percent of a Home's Value	
		Percent of a Home's Value		Percent of a Home's Value		Percent of a Home's Value	
Standard HAMP Modifications ^a	227,000	69,000		39,000		63,000	
Principal Forgiveness Modifications ^a	n.a.	187,000		214,000		221,000	
Total Number of Modifications ^a	227,000	256,000		253,000		284,000	
Number of Defaults ^a	599,000	581,000		556,000		504,000	
Net Increase or Decrease (-) in the Budget Deficit Relative to Current Policy (Billions of 2013 dollars)	n.a.	-0.2		-2.8		-2.2	

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk).

GSE = government-sponsored enterprise (specifically, Fannie Mae and Freddie Mac); HAMP = Home Affordable Modification Program; n.a. = not applicable.

a. Out of 1.2 million eligible or potentially eligible borrowers

Table 2.
Number of Residential Mortgages, Fourth Quarter of 2012

	Total	Loans Owned or Guaranteed by Fannie Mae or Freddie Mac	Percentage Owned or Guaranteed by Fannie Mae or Freddie Mac
Seriously Delinquent Loans^a			
Loan-to-value ratio of 100 percent or greater	1,560,000	390,000	25
Loan-to-value ratio of less than 100 percent	1,720,000	540,000	31
Not Seriously Delinquent Loans			
Loan-to-value ratio of 100 percent or greater	8,840,000	2,650,000	30
Loan-to-value ratio of less than 100 percent	36,250,000	24,880,000	69
Total	48,370,000	28,460,000	59
Memorandum:			
Total with Loan-to-Value Ratio of 100 Percent or Greater	10,400,000	3,040,000	29
Fannie Mae or Freddie Mac Loans Eligible for Principal Forgiveness ^b	n.a.	610,000	n.a.
Fannie Mae or Freddie Mac Loans Potentially Eligible for Principal Forgiveness ^c	n.a.	550,000	n.a.

Sources: Congressional Budget Office; CoreLogic; Mortgage Bankers Association.

Note: n.a. = not applicable.

a. Seriously delinquent borrowers are 90 days or more past due on their mortgage payments or are in the process of foreclosure.

b. Fannie Mae or Freddie Mac loans eligible for principal forgiveness are loans held by borrowers who meet all Home Affordable Modification Program (HAMP) eligibility criteria, including debt-to-income ratios greater than 31 percent and evidence of financial distress.

c. Fannie Mae or Freddie Mac loans potentially eligible for principal forgiveness are loans held by borrowers who meet all HAMP eligibility criteria but do not show evidence of financial distress.

Table 3.
Overview of Home Affordable Modification Program and Principal Forgiveness Modifications

	Standard HAMP	HAMP Principal Reduction Alternative	Principal Forgiveness to 100 Percent of a Home's Value	Principal Forgiveness to 90 Percent of a Home's Value
Target	Reduce borrower's monthly mortgage payment to 31 percent of monthly gross income	Reduce borrower's monthly mortgage payment to 31 percent of monthly gross income	Reduce borrower's unpaid mortgage principal balance to 100 percent of current home value	Reduce borrower's unpaid mortgage principal balance to 90 percent of current home value
Payment Reduction Mechanism	<ul style="list-style-type: none"> Step 1: Capitalize accrued interest and other fees owed by the borrower Step 2: Reduce loan interest rate to a floor of 2% Step 3: Extend loan term to a maximum of 40 years (if necessary) Step 4: Forbear principal into a non-interest bearing, non-amortizing balloon loan (if necessary) 	<ul style="list-style-type: none"> Step 1: Capitalize accrued interest and other fees owed by the borrower Step 2: Reduce principal to a floor of 115 percent of current home value Step 3: Reduce loan interest rate to a floor of 2% (if necessary) Step 4: Extend loan term to a maximum of 40 years (if necessary) Step 5: Forbear principal into a non-interest bearing, non-amortizing balloon loan (if necessary) 	<ul style="list-style-type: none"> Step 1: Capitalize accrued interest and other fees owed by the borrower Step 2: Reduce principal to 100 percent of current home value 	<ul style="list-style-type: none"> Step 1: Capitalize accrued interest and other fees owed by the borrower Step 2: Reduce principal to 90 percent of current home value
Borrower Advantages Relative to Standard HAMP		<ul style="list-style-type: none"> Principal reduction to 115 percent 	<ul style="list-style-type: none"> Principal reduction to 100 percent Unlike HAMP and HAMP PRA, which reset the borrower's interest rate to a market rate after five years, the full monthly mortgage payment reduction remains beyond five years 	<ul style="list-style-type: none"> Principal reduction to 90 percent Unlike HAMP and HAMP PRA, which reset the borrower's interest rate to a market rate after five years, the full monthly mortgage payment reduction remains beyond five years
Borrower Disadvantages Relative to Standard HAMP		<ul style="list-style-type: none"> Tax burden associated with forgiven principal 		
Advantages to the Government Relative to Standard HAMP		<ul style="list-style-type: none"> Improved performance on mortgage as a result of improved equity 		
Disadvantages to the Government Relative to Standard HAMP			<ul style="list-style-type: none"> Lost principal from forgiveness 	

Source: Congressional Budget Office.

Note: HAMP = Home Affordable Modification Program.

Table 4.
Design Considerations Used in CBO's Analysis of Principal Forgiveness Modifications

Design Consideration	Assumption in CBO's Analysis
Amount of Principal Forgiveness	Postmodification loan-to-value ratios would be as low as 115 percent for Home Affordable Modification Program Principal Reduction Alternative and 100 percent or 90 percent for stand-alone principal forgiveness modifications
Approaches to Reduce Moral Hazard	Program features designed to target borrowers experiencing greater financial distress
Eligibility	Delinquent borrowers and current borrowers who provide evidence of financial distress and have a current debt-to-income ratio greater than 31 percent are eligible; no cap on the number of months of delinquency; only owner-occupants are eligible; no explicit restrictions with respect to credit score
Prepayment or Default After Modification	Forgiven principal must be earned over a three-year period
The Role of Private Mortgage Insurers and Second-Lien Holders	A level of private mortgage insurer risk-sharing consistent with the modified loan; no explicit additional compensation is provided by second-lien holders
Operational Costs	Operational costs are set at \$80 million
Timing	Modifications are completed over a two-year period
Source: Congressional Budget Office.	

Table 5.
Impact of Different Modification Programs for an Illustrative Borrower

	No Modification	Standard HAMP	HAMP Principal Reduction Alternative	Principal Forgiveness to 100 Percent of a Home's Value	Principal Forgiveness to 90 Percent of a Home's Value
Home Value	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
Monthly Income	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000
Loan Balance	\$200,000	\$200,000	\$143,750	\$125,000	\$112,500
Loan Interest Rate	6.00%	2.00%	3.25%	5.00%	5.00%
Loan Term (Months)	360	453	360	360	360
Monthly Payment	\$1,199	\$629	\$629	\$671	\$604
Loan-to-Value Ratio	160%	160%	115%	100%	90%
Debt-to-Income Ratio	60%	31%	31%	34%	30%
Expected One-Year Default Rate	80%	17%	9%	5%	1%
Expected Three-Year Default Rate	97%	55%	33%	16%	5%
Expected Lifetime Default Rate	98%	89%	51%	31%	12%
Principal Forbearance	n.a.	n.a.	n.a.	n.a.	n.a.
Principal Forgiveness	n.a.	n.a.	\$56,250	\$75,000	\$87,500
Expected Subsidy Cost	\$97,502	\$108,274	\$107,881	\$98,510	\$97,299

Source: Congressional Budget Office.

Notes: The illustrative borrower is assumed to have a credit score of 660 and to be delinquent on his or her loan payments for 60 days.

The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

HAMP = Home Affordable Modification Program; n.a. = not applicable.

Table 6.
CBO's Central Estimates of the Impact of the GSEs' Current Policy and Three Options Involving Principal Forgiveness

(Billions of 2013 dollars)	Current Policy: Standard HAMP	Option 1: Standard HAMP or HAMP Principal Reduction Alternative	Option 2: Standard HAMP or Principal Forgiveness to 100 Percent of a Home's Value	Option 3: Standard HAMP or Principal Forgiveness to 90 Percent of a Home's Value
Total Number of Eligible and Potentially Eligible Borrowers	1,160,000	1,160,000	1,160,000	1,160,000
Modified Borrowers	227,000	256,000	253,000	284,000
Standard HAMP Modifications	227,000	69,000	39,000	63,000
Principal Forgiveness Modifications	n.a.	187,000	214,000	221,000
HAMP-Eligible Borrowers	227,000	249,000	241,000	279,000
Potentially HAMP-Eligible Borrowers	n.a.	7,000	12,000	5,000
Number of Defaults	599,000	581,000	556,000	504,000
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a.	-0.30	-2.90	-2.40
Portfolio Costs for Federal Investors ^a	n.a.	0.06	0.05	0.11
Operational Costs for the GSEs ^b	n.a.	0.08	0.08	0.08
Net Increase or Decrease (-) in the Budget Deficit Relative to Current Policy	n.a.	-0.16	-2.77	-2.21

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk).

Estimates are for GSE-selected modifications.

HAMP-eligible borrowers meet all HAMP eligibility criteria, including debt-to-income ratios greater than 31 percent and evidence of financial distress.

Potentially HAMP-eligible borrowers meet all HAMP eligibility criteria but do not show evidence of financial distress.

HAMP = Home Affordable Modification Program; GSE = government-sponsored enterprise (specifically, Fannie Mae and Freddie Mac); n.a. = not applicable.

a. Based on the cost of incremental modifications using a 2 percent premium on modified loans and a 50 percent share for federal investors in mortgage-backed securities containing modified loans.

b. Based on an \$80 million cost to the GSEs for implementing principal forgiveness.

Table 7.
Effects of GSE- and Borrower-Selected Modifications on CBO's Estimates of the Number of Borrowers and the Federal Budget Deficit
(Billions of 2013 dollars)

	Current Policy: Standard HAMP	Option 1: Standard HAMP or HAMP Principal Reduction Alternative		Option 2: Standard HAMP or Principal Forgiveness to 100 Percent of a Home's Value		Option 3: Standard HAMP or Principal Forgiveness to 90 Percent of a Home's Value	
		Central Estimate with GSE-Selected Modifications		Central Estimate with Borrower-Selected Modifications			
Number of Modified Borrowers	227,000	256,000		253,000		284,000	
HAMP-Eligible Borrowers ^a	227,000	249,000		241,000		279,000	
Potentially HAMP-Eligible Borrowers ^b	n.a.	7,000		12,000		5,000	
Net Increase or Decrease (-) in the Budget Deficit Relative to Current Policy	n.a.	-0.2		-2.8		-2.2	
Modified Borrowers	227,000	273,000		337,000		425,000	
HAMP-Eligible Borrowers ^a	227,000	263,000		300,000		340,000	
Potentially HAMP-Eligible Borrowers ^b	n.a.	10,000		37,000		85,000	
Net Increase or Decrease (-) in the Budget Deficit Relative to Current Policy	n.a.	0.1		-0.4		0.7	

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk).

HAMP-eligible borrowers meet all HAMP eligibility criteria, including debt-to-income ratios greater than 31 percent and evidence of financial distress.

Potentially HAMP-eligible borrowers meet all HAMP eligibility criteria but do not show evidence of financial distress.

HAMP = Home Affordable Modification Program; GSE = government-sponsored enterprise (specifically, Fannie Mae and Freddie Mac); n.a. = not applicable.

a. Out of 610,000 HAMP-eligible borrowers

b. Out of 550,000 potentially HAMP-eligible borrowers

Table 8.
CBO's Estimates of the Impact of Three Options for the GSEs Involving Principal Forgiveness Under Alternative Assumptions

(Billions of 2013 dollars)	Option 1: Standard HAMP or HAMP Principal Reduction Alternative	Option 2: Standard HAMP or Principal Forgiveness to 100 Percent of a Home's Value	Option 3: Standard HAMP or Principal Forgiveness to 90 Percent of a Home's Value
Difference in Number of Defaults Relative to Current Policy			
Central Estimate	-18,000	-43,000	-95,000
Range	-28,000 to -3,000	-63,000 to -30,000	-146,000 to -73,000
Net Increase or Decrease (-) in the Budget Deficit Relative to Current Policy			
Central Estimate	-0.2	-2.8	-2.2
Range	-0.3 to 0.1	-4.2 to -1.3	-4.0 to 1.9 ^a

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk). The ranges are based on estimated high and low values for those key parameters.

HAMP = Home Affordable Modification Program; GSE = government-sponsored enterprise (specifically, Fannie Mae and Freddie Mac); n.a. = not applicable.

a. Option 3 would decrease the budget deficit in eight out of nine alternative scenarios that CBO analyzed.

Table 9.
Effects of Fewer Defaults on the Federal Budget Deficit

(Billions of 2013 dollars)	Option 1: Standard HAMP or HAMP Principal Reduction Alternative	Option 2: Standard HAMP or Principal Forgiveness to 100 Percent of a Home's Value	Option 3: Standard HAMP or Principal Forgiveness to 90 Percent of a Home's Value
CBO's Central Estimate	-0.2	-2.8	-2.2
50 Percent Default Rate and the GSEs Select Modification	-0.2	-2.7	-2.2
50 Percent Default Rate and Potentially HAMP-Eligible Borrowers Select Modification	0	-2.0	-0.2
50 Percent Default Rate and Potentially HAMP-Eligible Borrowers Select Modification at Two Times Expected Participation Rate	0.1	-1.3	1.9

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk).

HAMP-eligible borrowers meet all HAMP eligibility criteria, including debt-to-income ratios greater than 31 percent and evidence of financial distress.

Potentially HAMP-eligible borrowers meet all HAMP eligibility criteria but do not show evidence of financial distress.

HAMP = Home Affordable Modification Program; GSE = government-sponsored enterprise (specifically, Fannie Mae and Freddie Mac); n.a. = not applicable.

Table B-1.
Design Considerations in a Shared Appreciation Modification (SAM)

Design Consideration	SAM Options
Amount of Principal Forgiveness	<ul style="list-style-type: none"> Like a standard principal forgiveness modification, a SAM could reduce negative equity (creating a postmodification loan-to-value ratio, or LTV, greater than 100 percent), eliminate negative equity (creating a postmodification LTV ratio of 100 percent), or create positive equity (a postmodification LTV ratio of less than 100 percent).
Type of Equity Shared	<ul style="list-style-type: none"> Three types of equity can be shared: 1) Equity created by a write-down of the loan to a current LTV ratio of less than 100 percent; 2) Equity created by home appreciation; and 3) Equity created by a pay-down of the mortgage.⁵² Home appreciation created by homeowner improvements may complicate the equity-sharing agreement and should be codified in detail in the SAM contract.
Share Arrangement	<ul style="list-style-type: none"> Granting a large share of equity to homeowners may increase their incentive to perform on the modified loan. However, it may reduce investors' willingness to participate in the modification. Granting a large share of equity to homeowners may also limit the effectiveness of shared appreciation as a mitigant to moral hazard.
Exercise or Termination of Agreement	<ul style="list-style-type: none"> A number of different dates could be used to determine the value of the home for the purposes of calculating the amount of equity to be shared, including the sale of the home or the payoff of the loan. The impact of refinancing or defaulting on the modified mortgage may complicate the equity-sharing agreement and should be codified in detail in the SAM contract.

Source: Congressional Budget Office.

⁵² The terms "shared appreciation" and "shared equity" are often used interchangeably. The main distinction is that with a shared equity modification, the homeowner and third-party investor will share both home appreciation and equity created through the amortization of the mortgage. With shared appreciation, the two parties typically share only the value created through appreciation.

Table B-2.
Shared Appreciation Modification (SAM) Investor Cash Flows

Current Home Value	Investor Share	Discount Rate	Years Until Termination of Shared Appreciation Modification											
			Two Years				Five Years				Ten Years			
			Value at Termination	Present Value	Value at Termination	Present Value	Value at Termination	Present Value	Value at Termination	Present Value	Value at Termination	Present Value	Value at Termination	Present Value
\$100,000	25%	10%	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
			\$2,500	\$2,066	\$2,500	\$1,552	\$2,500	\$1,552	\$2,500	\$964	\$2,500	\$964	\$2,500	\$372
			\$5,000	\$4,132	\$5,000	\$3,105	\$5,000	\$3,105	\$5,000	\$1,928	\$5,000	\$1,928	\$5,000	\$743
			\$7,500	\$6,198	\$7,500	\$4,657	\$7,500	\$4,657	\$7,500	\$2,892	\$7,500	\$2,892	\$7,500	\$1,115
			\$10,000	\$8,264	\$10,000	\$6,209	\$10,000	\$6,209	\$10,000	\$3,855	\$10,000	\$3,855	\$10,000	\$1,486
			\$12,500	\$10,331	\$12,500	\$7,762	\$12,500	\$7,762	\$12,500	\$4,819	\$12,500	\$4,819	\$12,500	\$1,858
			\$15,000	\$12,397	\$15,000	\$9,314	\$15,000	\$9,314	\$15,000	\$5,783	\$15,000	\$5,783	\$15,000	\$2,230
			\$17,500	\$14,463	\$17,500	\$10,866	\$17,500	\$10,866	\$17,500	\$6,747	\$17,500	\$6,747	\$17,500	\$2,601
			\$20,000	\$16,529	\$20,000	\$12,418	\$20,000	\$12,418	\$20,000	\$7,711	\$20,000	\$7,711	\$20,000	\$2,973
			\$22,500	\$18,595	\$22,500	\$13,971	\$22,500	\$13,971	\$22,500	\$8,675	\$22,500	\$8,675	\$22,500	\$3,344
			\$25,000	\$20,661	\$25,000	\$15,523	\$25,000	\$15,523	\$25,000	\$9,639	\$25,000	\$9,639	\$25,000	\$3,716

Total Home Price Change	Home Value	Appreciation
-10%	\$90,000	(\$10,000)
0%	\$100,000	\$0
10%	\$110,000	\$10,000
20%	\$120,000	\$20,000
30%	\$130,000	\$30,000
40%	\$140,000	\$40,000
50%	\$150,000	\$50,000
60%	\$160,000	\$60,000
70%	\$170,000	\$70,000
80%	\$180,000	\$80,000
90%	\$190,000	\$90,000
100%	\$200,000	\$100,000

Source: Congressional Budget Office.

Note: This example assumes that the home has a current value of \$100,000, that investors receive a 25 percent share of the appreciation in the home's value, and that those proceeds are discounted at a 10 percent rate. The present value of expected cash flows is not necessarily equal to the value of the SAM contract to the investor at the time of the modification.

Table C-1.
Explanatory Variables in Prepayment and Default Equations

Variable Name	Description	Type	Notes on Usage
Loan-to-Value (LTV) Ratio	A ratio of the unpaid principal balance of the loan relative to the value of the home.	Static	<ul style="list-style-type: none"> For both unmodified borrowers and borrowers receiving standard HAMP (the Home Affordable Modification Program), LTV is based on the full loan amount and the value of the home at the time of the decision to modify. For HAMP PRA (Principal Reduction Alternative) and principal forgiveness, LTV is based on the loan amount minus the forgiven principal amount and the value of the home at the time of the decision to modify.
Credit Score	A score derived from the models developed by Fair Isaac Corporation used to measure a borrower's credit risk.	Static	<ul style="list-style-type: none"> For all borrowers, the credit score is assumed to be the one provided by a servicer as a part of the HAMP net-present-value submission.
Debt-to-Income (DTI) Ratio	A ratio of a borrower's monthly mortgage payment to his or her gross monthly income.	Static	<ul style="list-style-type: none"> For unmodified borrowers, DTI is based on the existing mortgage payment and does not include taxes and insurance. For HAMP, HAMP PRA, and principal forgiveness, DTI is based on the mortgage payment after modification and does not include taxes and insurance.
Loan Purpose Flag	Designates whether the loan is for the purchase of a home or the refinancing of an existing loan.	Static	<ul style="list-style-type: none"> For all borrowers, the loan is assumed to be a refinance.
Mortgage Age	The age of the loan during the current period.	Dynamic	<ul style="list-style-type: none"> For all borrowers, the loan is assumed to be zero months seasoned at the time of the decision to modify.
Probability of Negative Equity	A measure of the probability that the unpaid principal balance of the loan in the current period will be greater than the current value of the home.	Dynamic	<ul style="list-style-type: none"> For all borrowers, future house prices are based on CBO's forecast of the Federal Housing Finance Agency's house price index (all transactions, not seasonally adjusted) and a measure of house price volatility.
Treasury Yield Curve Slope	A ratio of the 10-year Treasury rate to the 1-year Treasury rate during the current period.	Dynamic	<ul style="list-style-type: none"> For all borrowers, Treasury rates are based on CBO's macroeconomic forecast from February 2013.
Mortgage Premium	A measure of the difference between the borrower's note rate and the current market rate relative to the borrower's note rate.	Dynamic	<ul style="list-style-type: none"> For all borrowers, the current market rate is based on the conventional 30-year fixed-rate mortgage from CBO's macroeconomic forecast for February 2013. For unmodified borrowers, the borrower's current note rate is assumed to be 6 percent. For HAMP and HAMP PRA, the borrower's current note rate is set by the waterfall process for the first five years and set to the current market rate for the remaining term. For principal forgiveness, the borrower's current note rate is assumed to be 5 percent after the modification.

Variable Name	Description	Type	Notes on Usage
Burnout	A measure of whether a borrower has missed recent opportunities to refinance. It is set to zero for the first eight quarters and equal to the average difference between the borrower's note rate and the current market rate over the past eight quarters for the remaining term.	Dynamic	<ul style="list-style-type: none"> For all borrowers, the current market rate is based on the conventional 30-year fixed-rate mortgage from CBO's macroeconomic forecast from February 2013.

Source: Congressional Budget Office.

Table C-2.
Explanatory Variables in Loss-Given-Default Equation

Variable Name	Description	Type	Notes on Usage
Original Loan-to-Value (LTV) Ratio	A ratio of the unpaid principal balance of the loan relative to the value of the home at the time of origination.	Static	<ul style="list-style-type: none"> For all borrowers, the original LTV is assumed to be the LTV at the time of modification.
Credit Score	A score derived from the models developed by Fair Isaac Corporation used to measure a borrower's credit risk.	Static	<ul style="list-style-type: none"> For all borrowers, the credit score is assumed to be the one provided by a servicer as a part of the Home Affordable Modification Program's net-present-value submission.
Origination Year	The year during which the loan was originated.	Static	<ul style="list-style-type: none"> For all borrowers, the origination year is assumed to be 2014.
Loan Purpose Flag	Designates whether the loan is for the purchase of a home or the refinance of an existing loan.	Static	<ul style="list-style-type: none"> For all borrowers, the loan is assumed to be a refinance.
Mortgage Age	The age of the loan during the current period.	Dynamic	<ul style="list-style-type: none"> For all borrowers, the loan is assumed to be zero months seasoned at the time of the decision to modify.
Current Loan-to-Value Ratio	A ratio of the unpaid principal balance of the loan in the current period to the current value of the home.	Dynamic	<ul style="list-style-type: none"> For all borrowers, future house prices are based on CBO's forecast of the Federal Housing Finance Agency's house price index (all transactions, not seasonally adjusted) and a measure of house price volatility.
Treasury Yield Curve Slope	A ratio of the 10-year Treasury rate to the 1-year Treasury rate during the current period.	Dynamic	<ul style="list-style-type: none"> For all borrowers, Treasury rates are based on CBO's macroeconomic forecast from February 2013.

Source: Congressional Budget Office.

Table C-3.
Changes to Variables in the Behavioral Model for Each Policy Option

Variable Name	No Modification	Home Affordable Modification Program (HAMP)	HAMP Principal Reduction Alternative	Principal Forgiveness to 90 or 100 Percent
Loan-to-Value (LTV) Ratio (Default and Prepayment Models)	Equal to premodification loan amount divided by current value of the home.	Equal to premodification loan amount divided by current value of the home.	Decreased to produce payment resulting in 31 percent DTI ratio or 115 percent LTV ratio, whichever is lower.	Set to 90 percent or 100 percent.
Debt-to-Income (DTI) Ratio (Default and Prepayment Models)	Equal to premodification value.	Set to 31 percent.	Set to 31 percent.	Based on monthly payment on loan amount producing a 90 percent or 100 percent LTV ratio.
Probability of Negative Equity (Default and Prepayment Models)	Based on marked-to-market LTV ratio calculated on premodification loan amount, 360 months, and projected house price.	Based on marked-to-market LTV ratio calculated on premodification loan amount, modified term, and projected house price.	Based on marked-to-market LTV ratio calculated on modified loan amount, modified term, and projected house price.	Based on marked-to-market LTV ratio calculated on modified loan amount, premodification term of 360 months, and projected house price.
Mortgage Premium and Burnout (Default and Prepayment Models)	Based on difference between premodification note rate of 6 percent and projected market rate.	Based on difference between modified note rate and projected market rate. Modified note rate for first five years will be set to the higher of 2 percent or rate needed to produce payment resulting in 31 percent DTI ratio. In year five, note rate will be set to prevailing market rate and remain fixed for the remainder of the term.	Based on difference between modified note rate and projected market rate. Modified note rate for first five years will be set to the higher of 2 percent or rate needed to produce payment resulting in 31 percent DTI ratio. In year five, note rate will be set to prevailing market rate and remain fixed for the remainder of the term.	Based on difference between modified note rate of 5 percent and projected market rate.
Current LTV Ratio (Loss-Given-Default Model)	Based on premodification loan amount, premodification term of 360 months, and projected house price.	Based on premodification loan amount, modified term, and projected house price.	Based on modified loan amount, modified term, and projected house price.	Based on modified loan amount, premodification term of 360 months, and projected house price.

Source: Congressional Budget Office.

Table C-4.
Sample Statistics for Population Eligible for the Home Affordable Modification Program

Current Loan-to-Value Ratio Bucket	Percentage of Premodification Unpaid Principal Balance	Days Delinquent Bucket	Percentage of Premodification Unpaid Principal Balance
100	36	0	18
120	24	30	10
140	16	60	8
160	10	90	7
180	6	120	12
200	8	180	45

Debt-to-Income Ratio Bucket	Percentage of Premodification Unpaid Principal Balance
40	63
60	30
80	7

Credit Score Bucket	Percentage of Premodification Unpaid Principal Balance
600	52
660	21
700	10
740	17

Source: Congressional Budget Office.

Table C-5.
Sample Statistics for the Population Potentially Eligible for the Home Affordable Modification Program

Current Loan-to-Value Ratio Bucket	Percentage of Premodification Unpaid Principal Balance	Debt-to-Income Ratio Bucket	Percentage of Premodification Unpaid Principal Balance
100	52	34	35
120	44	38	24
150	2	45	28
180	2	60	13

Credit Score Bucket	Percentage of Premodification Unpaid Principal Balance
600	Less than 1
660	Less than 1
700	15
750	56
820	29

Source: Congressional Budget Office.

Table D-1.

Subsidy Cost and Modifications for Policy Options Under Alternative Assumptions

	Current Policy: Standard HAMP	Option 1: HAMP or HAMP Principal Reduction Alternative	Option 2: HAMP or Principal Forgiveness to 100 Percent of a Home's Value	Option 3: HAMP or Principal Forgiveness to 90 Percent of a Home's Value
CBO's Central Estimate				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.3	-\$2.9	-\$2.4
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	-\$0.2	-\$2.8	-\$2.2
Number of Borrowers Modified	226,700	256,300	252,700	284,000
HAMP Modifications	226,700	69,300	39,100	63,200
Principal Forgiveness Modifications	0	187,000	213,600	220,800
Cumulative Lifetime Default Rate	52	50	48	43
Expected Defaults	599,200	581,000	555,900	504,200
Number of Mods for Potentially HAMP-Eligible Borrowers	0	6,500	11,900	4,500
Average Modified DTI	31%	31%	35%	33%
Average Payment Reduction	\$440	\$431	\$350	\$410
50 Percent Default Rate and GSEs Select Modification				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.3	-\$2.8	-\$2.3
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	-\$0.2	-\$2.7	-\$2.2
Number of Borrowers Modified	226,700	249,900	240,900	279,400
HAMP Modifications	226,700	69,300	39,100	63,200
Principal Forgiveness Modifications	0	180,600	201,800	216,300
Cumulative Lifetime Default Rate	47	45	43	39
Expected Defaults	541,700	524,900	502,300	448,600
Number of Mods for Potentially HAMP-Eligible Borrowers	0	0	100	0
Average Modified DTI	31%	31%	36%	33%
Average Payment Reduction	\$440	\$436	\$352	\$412
50 Percent Default Rate and Borrowers Select Modification				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.1	-\$2.2	-\$0.6
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	\$0.0	-\$2.0	-\$0.2
Number of Borrowers Modified	226,700	259,600	277,800	364,000
HAMP Modifications	226,700	69,300	39,100	63,200
Principal Forgiveness Modifications	0	190,300	238,700	300,900
Cumulative Lifetime Default Rate	47	45	43	38
Expected Defaults	541,700	523,700	497,300	436,900
Number of Mods for Potentially HAMP-Eligible Borrowers	0	9,700	37,000	84,600
Average Modified DTI	31%	31%	35%	32%
Average Payment Reduction	\$440	\$431	\$352	\$403
50 Percent Default Rate and Borrowers Select Modification at Two Times Expected Participation Rate				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	\$0.0	-\$1.6	\$1.4
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	\$0.1	-\$1.3	\$1.9
Number of Borrowers Modified	226,700	269,300	314,800	448,600
HAMP Modifications	226,700	69,300	39,100	63,200
Principal Forgiveness Modifications	0	200,000	275,700	385,500
Cumulative Lifetime Default Rate	47	45	42	37
Expected Defaults	541,700	522,500	492,200	425,100
Number of Mods for Potentially HAMP-Eligible Borrowers	0	19,400	74,000	169,200
Average Modified DTI	31%	31%	34%	31%
Average Payment Reduction	\$440	\$427	\$351	\$397

Current Policy: Standard HAMP	Option 1: HAMP or HAMP Principal Reduction Alternative	Option 2: HAMP or Principal Forgiveness to 100 Percent of a Home's Value	Option 3: HAMP or Principal Forgiveness to 90 Percent of a Home's Value
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Low Sensitivity to DTI Ratio				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.2	-\$2.6	-\$2.0
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	\$0.0	-\$2.5	-\$1.9
Number of Borrowers Modified	226,700	252,200	242,500	271,100
HAMP Modifications	226,700	75,300	60,400	76,300
Principal Forgiveness Modifications	0	176,800	182,100	194,800
Cumulative Lifetime Default Rate	52	51	49	45
Expected Defaults	599,500	587,200	567,500	522,200
Number of Mods for Potentially HAMP-Eligible Borrowers	0	3,500	20,600	5,400
Average Modified DTI	31%	31%	36%	34%
Average Payment Reduction	\$440	\$431	\$318	\$391

High Sensitivity to DTI Ratio				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.4	-\$3.5	-\$2.9
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	-\$0.3	-\$3.3	-\$2.6
Number of Borrowers Modified	226,700	260,800	279,400	330,400
HAMP Modifications	226,700	61,400	27,600	24,900
Principal Forgiveness Modifications	0	199,400	251,800	305,400
Cumulative Lifetime Default Rate	52	50	47	40
Expected Defaults	607,400	579,700	544,700	461,300
Number of Mods for Potentially HAMP-Eligible Borrowers	0	9,300	15,800	17,600
Average Modified DTI	31%	31%	34%	32%
Average Payment Reduction	\$440	\$431	\$382	\$437

Low Sensitivity to LTV Ratio				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.2	-\$2.5	-\$2.4
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	-\$0.1	-\$2.4	-\$2.2
Number of Borrowers Modified	226,700	245,200	248,000	282,900
HAMP Modifications	226,700	80,700	35,900	56,900
Principal Forgiveness Modifications	0	164,500	212,100	226,000
Cumulative Lifetime Default Rate	37	36	33	29
Expected Defaults	430,200	413,200	387,400	341,900
Number of Mods for Potentially HAMP-Eligible Borrowers	0	2,000	200	1,300
Average Modified DTI	31%	31%	35%	34%
Average Payment Reduction	\$440	\$440	\$357	\$402

High Sensitivity to LTV Ratio				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.2	-\$2.1	-\$1.5
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	\$0.0	-\$2.0	-\$1.3
Number of Borrowers Modified	226,700	250,400	250,400	297,900
HAMP Modifications	226,700	83,400	73,700	126,800
Principal Forgiveness Modifications	0	167,000	176,700	171,100
Cumulative Lifetime Default Rate	78	78	76	72
Expected Defaults	908,900	906,400	879,200	836,400
Number of Mods for Potentially HAMP-Eligible Borrowers	0	2,600	31,200	47,800
Average Modified DTI	31%	31%	35%	32%
Average Payment Reduction	\$440	\$433	\$336	\$400

	Current Policy: Standard HAMP	Option 1: HAMP or HAMP Principal Reduction Alternative	Option 2: HAMP or Principal Forgiveness to 100 Percent of a Home's Value	Option 3: HAMP or Principal Forgiveness to 90 Percent of a Home's Value
Flat Market Risk Premium				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.4	-\$2.4	-\$1.7
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	-\$0.3	-\$2.3	-\$1.6
Number of Borrowers Modified	226,700	260,300	256,600	279,800
HAMP Modifications	226,700	35,700	15,100	65,500
Principal Forgiveness Modifications	0	224,600	241,500	214,300
Cumulative Lifetime Default Rate	52	50	47	43
Expected Defaults	599,200	574,700	541,300	498,900
Number of Mods for Potentially HAMP-Eligible Borrowers	0	2,900	800	0
Average Modified DTI	31%	31%	35%	33%
Average Payment Reduction	\$440	\$436	\$367	\$419
Steep Market Risk Premium				
Net Increase or Decrease (-) in Subsidy Cost from Current Policy	n.a	-\$0.3	-\$4.3	-\$4.3
Net Increase or Decrease (-) in the Budget Deficit from Current Policy	n.a	-\$0.2	-\$4.2	-\$4.0
Number of Borrowers Modified	226,700	247,400	260,800	346,500
HAMP Modifications	226,700	98,900	80,500	49,500
Principal Forgiveness Modifications	0	148,500	180,400	297,000
Cumulative Lifetime Default Rate	52	51	49	41
Expected Defaults	599,200	587,900	568,700	473,300
Number of Mods for Potentially HAMP-Eligible Borrowers	0	7,900	30,400	49,400
Average Modified DTI	31%	31%	35%	31%
Average Payment Reduction	\$440	\$430	\$349	\$426

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk).

DTI parameter was either reduced by 50 percent (for decreased sensitivity) or increased by 100 percent (for increased sensitivity). In both cases, the constant of the equation was adjusted such that total subsidy costs in the case of no modification were equal to those generated by the model without the adjustment to the DTI coefficient.

LTV parameter was either reduced by 50 percent (for decreased sensitivity) or increased by 100 percent (for increased sensitivity). No change was made to the constant in either scenario, in an effort to have the sensitivity to LTV reflected in standard HAMP and all policy options.

The slope of the relationship between the risk premium and the cumulative lifetime default rate was either reduced by approximately 50 percent (for a flatter premium) or increased by approximately 100 percent (for a steeper premium).

HAMP = Home Affordable Modification Program; LTV = loan to value; DTI = debt to income; GSE = government-sponsored enterprise (specifically, Fannie Mae and Freddie Mac); n.a. = not applicable.

Table E-1.
Reconciling CBO's and FHFA's Estimates of Modification Costs

(Cost as a share of unpaid principal balance)	No Modification	Current Policy: Standard HAMP	HAMP Principal Reduction Alternative	Option 1: Principal Forgiveness to 100 Percent of a Home's Value	Option 2: Principal Forgiveness to 90 Percent of a Home's Value	Option 3: Principal Forgiveness to 80 Percent of a Home's Value
CBO's Central Estimate						
<i>with modification policy adjustment^a</i>	25%	27%		27%	26%	26%
<i>and with population adjustments</i>	25%	27%		27%	26%	27%
<i>minus potentially HAMP-eligible loans</i>	33%	36%		36%	34%	35%
<i>with 100 percent participation</i>	33%	39%		39%	35%	35%
<i>without less than 115 LTV ratio loans</i>	41%	46%		45%	43%	43%
<i>and with model adjustments</i>						
<i>with lower defaults^b</i>	41%	45%		44%	41%	42%
<i>with higher severity^c</i>	48%	50%		48%	43%	43%
<i>with discount rate changes^d</i>	45%	38%		36%	34%	37%
<i>and without guarantee fee income</i>	45%	39%		37%	35%	39%
FHFA's Estimate^e	45%	39%		38%	n.a.	n.a.

Source: Congressional Budget Office.

Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.

The central estimates are based on CBO's values for key parameters of relevant economic behavior (such as the sensitivity of defaults to additional incentives offered under principal forgiveness, changes in monthly payments, or changes in loan-to-value ratios) and the sensitivity of private investors to losses that cannot be avoided through diversification (known as market risk).

FHFA = Federal Housing Finance Agency; HAMP = Home Affordable Modification Program; LTV = loan to value; n.a. = not applicable.

a. Based on replacing, rather than augmenting, standard HAMP with a principal forgiveness modification.

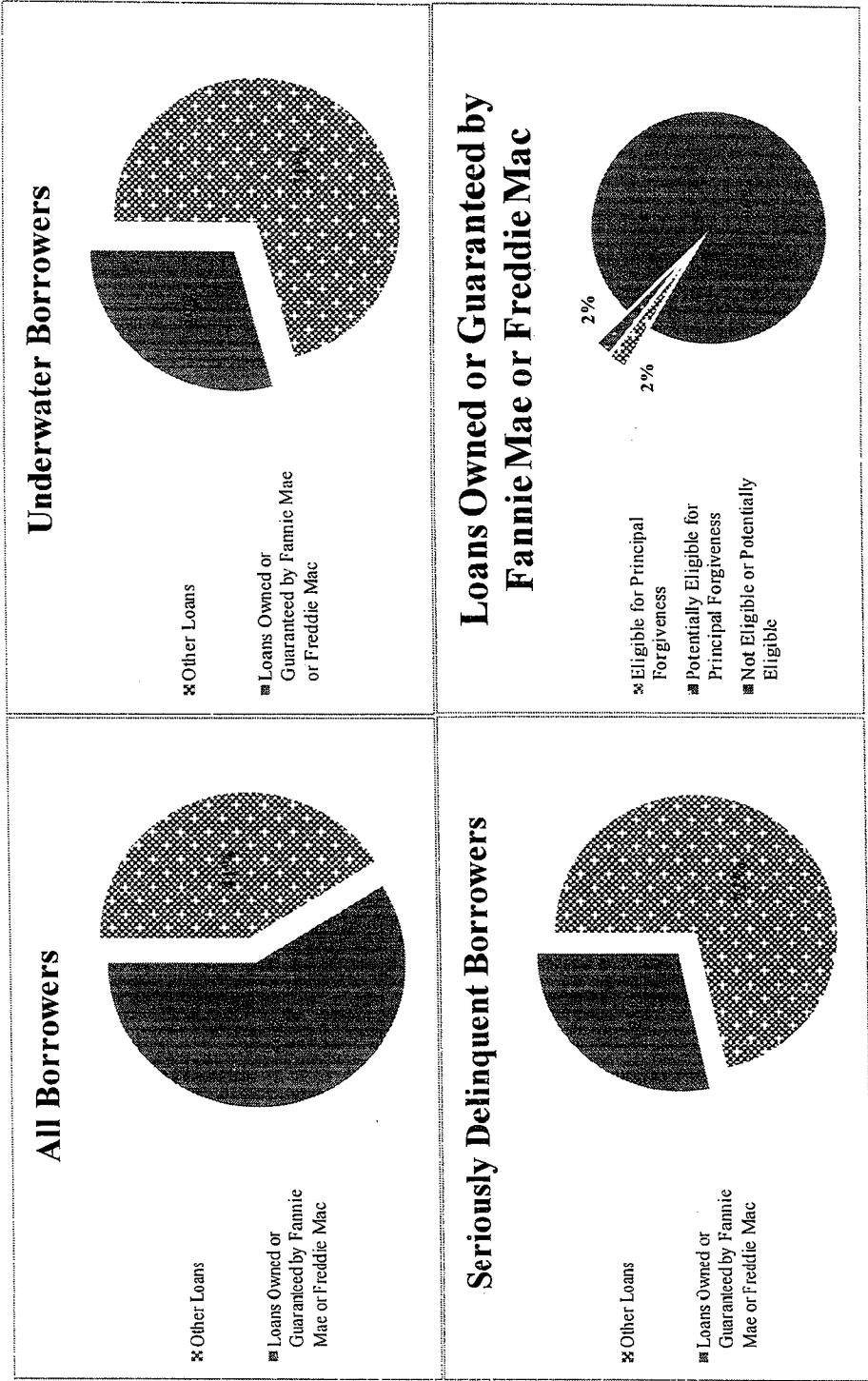
b. Reduces expected defaults on unmodified loans by approximately 10 percent and modified loans by approximately 25 percent.

c. Increases severity by approximately 15 percent.

d. Sets discount rate to FreddieMac survey rate for June 28, 2012, and sets risk premium to zero for all loans.

e. From FHFA's Analysis 11, based on a \$99.3 billion HAMP-eligible population and 100 percent participation in each modification.

Figure 1.
Share of Residential Mortgages, by Category of Borrower, Fourth Quarter of 2012



Sources: Congressional Budget Office; CoreLogic; Mortgage Bankers Association.

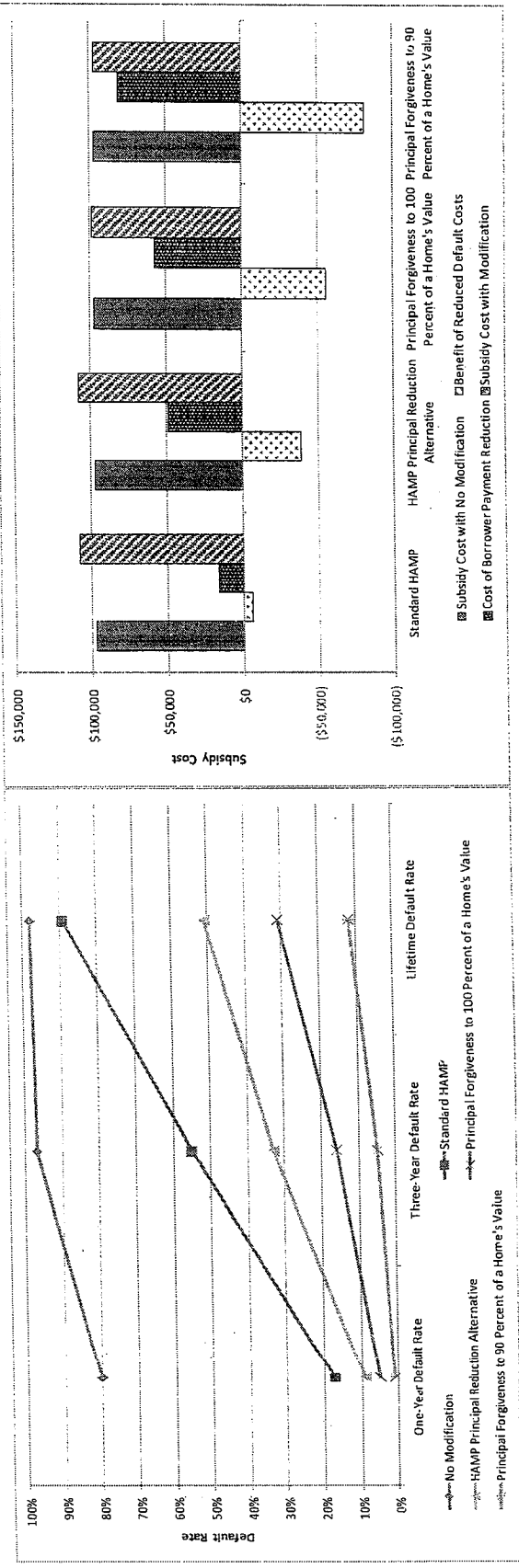
Notes: Underwater borrowers owe more on their mortgages than the value of their homes.

Seriously delinquent borrowers are 90 days or more past due on their mortgage payments or are in the process of foreclosure.

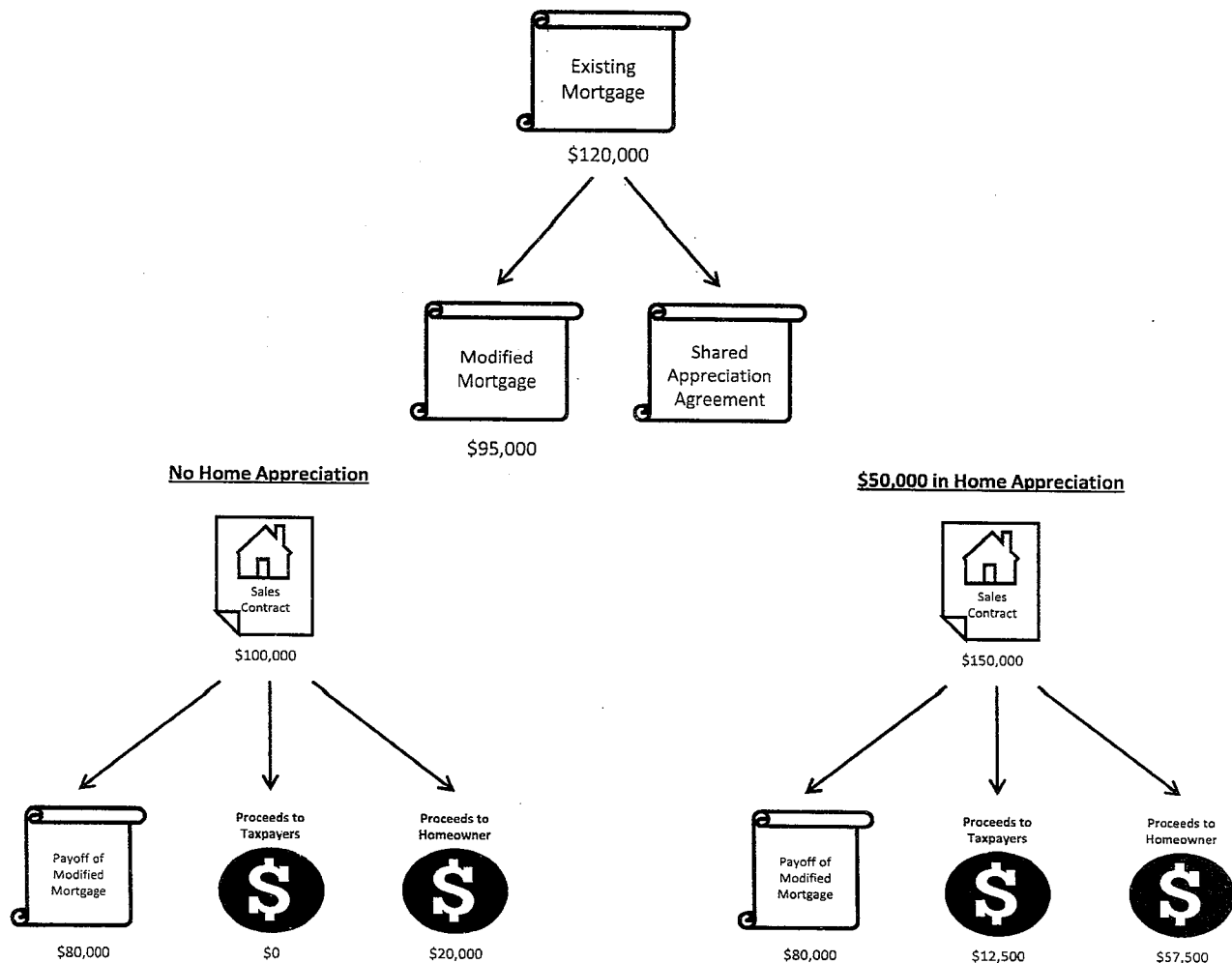
Fannie Mae or Freddie Mac loans eligible for principal forgiveness are loans held by borrowers who meet all Home Affordable Modification Program (HAMP) eligibility criteria, including debt-to-income ratios greater than 31 percent and evidence of financial distress.

Fannie Mae or Freddie Mac loans potentially eligible for principal forgiveness are loans held by borrowers who meet all HAMP eligibility criteria but do not show evidence of financial distress.

Figure 2.
Default Rates and Subsidy Costs for an Illustrative Borrower



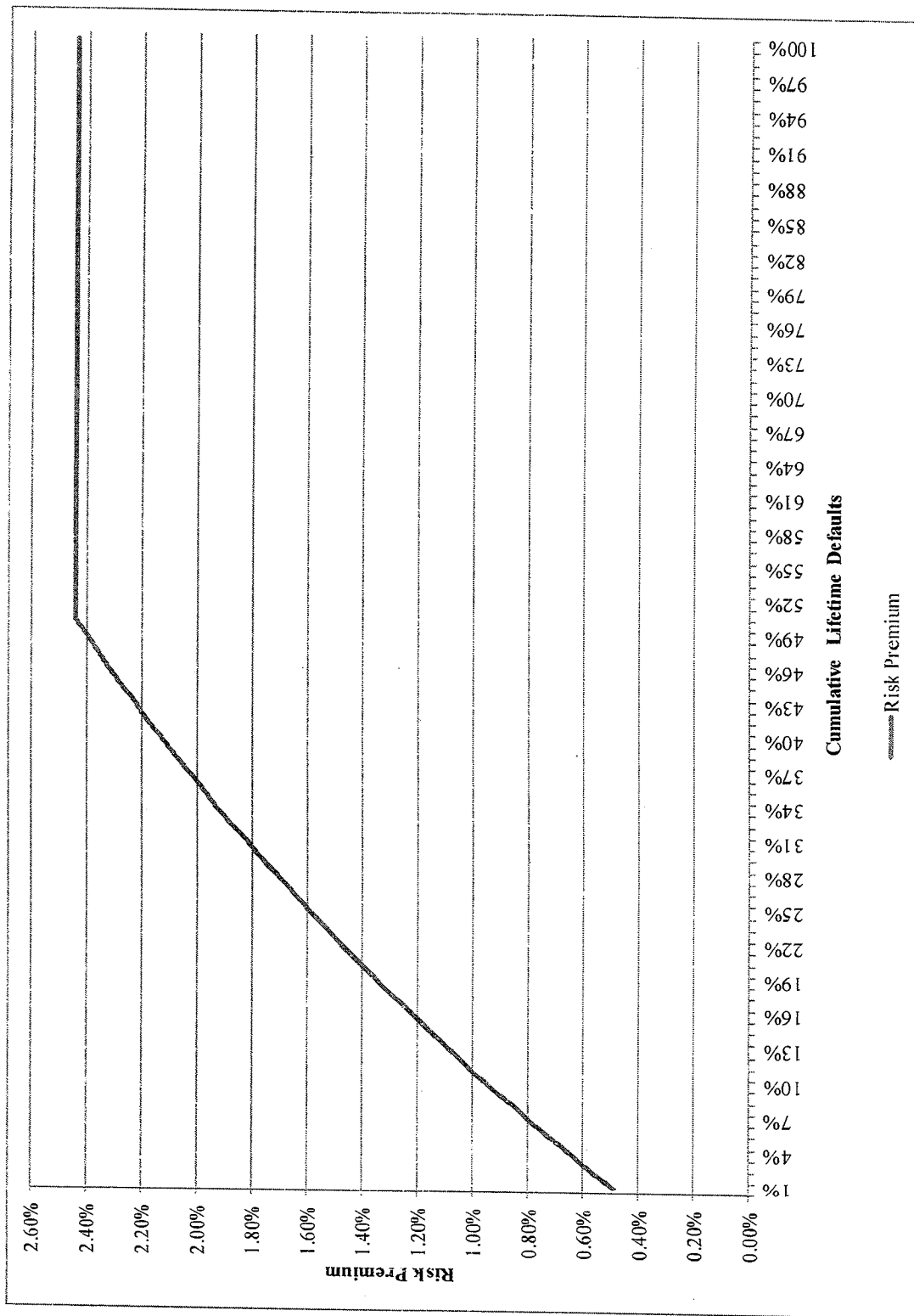
Sources: Congressional Budget Office.
Notes: The HAMP Principal Reduction Alternative involves lowering the monthly mortgage payment to 31 percent of gross monthly income primarily by reducing the outstanding loan balance to as low as 115 percent of a home's current assessed value.
HAMP = Home Affordable Modification Program.

Figure B-1.**Shared Appreciation Modification (SAM) Process at Modification and Sale**

Note: The current market value at the time of modification in this example is \$100,000. With a value of \$150,000 at sale, the appreciation is \$50,000, and 25 percent of that amount, or \$12,500, goes to the government.

Source: Congressional Budget Office.

**Figure C-1.
Risk Premium by Cumulative Expected Lifetime Defaults**



Source: Congressional Budget Office.